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口腔临床要点快速掌握系列

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牙周非手术治疗

Successful Periodontal Therapy: A Non-surgical Approach

▶ Peter A Heasman

Philip M Preshaw [编 著]

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国际口腔医学出版中心
策划编辑：杨 淮
编辑信箱：yangwayne@sohu.com
封面设计：吴朝洪

ISBN 978-7-5091-0607-5
9 787509 106075 >

销售分类 口腔医学
定价：68.00元

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牙周非手术治疗

Successful Periodontal Therapy: A Non-Surgical Approach

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Philip M Preshaw
Pauline Robertson
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人民军医出版社
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北　京

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图书在版编目（CIP）数据

牙周非手术治疗／（英）希斯曼（Heasman，P.A.）编著；闫福华主译．—北京：人民军医出版社，2007.2
（口腔临床要点快速掌握系列）
ISBN 978-7-5091-0607-5

Ⅰ．牙…　Ⅱ．①希…②闫…　Ⅲ．牙周病－治疗－汉、英　Ⅳ．R781.4

中国版本图书馆 CIP 数据核字（2006）第 147200 号

Successful Periodontal Therapy：A Non-Surgical Approach，by Heasman/Preshaw/Robertson，ISBN 1-85097-074-2由国际精萃出版集团（International Quintessence Publishing Group）提供中文版权，授权人民军医出版社出版并在全球发行该书中文版。

版权登记号：图字－军－2005-050 号

策划编辑：杨　淮　**文字编辑**：林　菲　**责任审读**：李　晨
出 版 人：齐学进
出版发行：人民军医出版社　　**经　销**：新华书店
通信地址：北京市 100036 信箱 188 分箱　**邮　编**：100036
电话：（010）66882586（发行部）、51927290（总编室）
传真：（010）68222916（发行部）、66882583（办公室）
网址：www.pmmp.com.cn

印刷：北京印刷一厂　　**装订**：春园装订厂
开本：889mm × 1194mm　1/32
印张：6　**字数**：221 千字
版、印次：2007 年 1 月第 1 版第 1 次印刷
印数：0001－3000
定价：68.00 元

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内容提要

“口腔临床要点快速掌握系列”是由国际著名的Quintessence出版集团近期出版的一套介绍口腔各科基本技术，最新医学理论的口腔专业丛书。丛书2002年起陆续出版发行，我社第一时间引进国内，以便国内读者同步了解国际口腔技术发展的新情况。本书由国际知名口腔专家编写，摆脱了一般专著的照本宣科的编撰风格，一切从临床实践出发，通过大量实例，讲解了牙周病非手术治疗的目的及临床疗效、口腔宣教阶段的治疗、牙周器械及其使用、全身性危险因素的处理、局部危险因素的处理、辅助治疗、牙周支持治疗等内容。本书采用中英对照的编排方式，对提高读者的专业英语水平大有裨益，适合临床口腔医师和口腔医学生阅读。

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序

成功的牙周治疗对于牙齿的长期保留非常重要。非手术治疗在牙周治疗中可称之为一门艺术，其成功有赖于诸多因素共同作用，包括疾病发展的复杂性、各种发病的危险因素、牙周诊断的技术、患者的管理及其就诊的动机、医生对新知识新技术的运用等，同时，不应忘记长期严格的牙周支持疗法与积极的常规牙周治疗一样重要。本书是丛书中有关牙周病学的第3本，薄薄的一本书却涵盖了上述如此众多的内容，以及其他一些相关的内容。

作为"口腔临床要点快速掌握系列"丛书的主编，本人阅读此书时有一种在不断学习的感觉，颇受启发，增长了不少新的知识。口腔医学生、临床实习技师，以及每位临床医师在阅读时若能与临床实践结合起来，一定会受益匪浅。

主　编　**Nairn Wilson**

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前　言

本书目的在于为牙科医师处理牙龈病和牙周病患者提供图文并茂的最新指南。本书首先讲述了非手术治疗的目标，随后是洁治阶段治疗的步骤和方法、刮治和根面平整及其所使用的工具、常见危险因素的处理以及牙周辅助治疗，最后论述了牙周支持治疗的重要性，此内容与普通牙科医师及那些已在牙周治疗中心接受过非手术治疗的患者息息相关。

希望读者阅读完本书，能达到以下目的：

- 了解非手术治疗后牙周伤口愈合情况。
- 认识到非手术治疗的局限性。
- 对目前化学、机械菌斑控制的产品有所了解。
- 了解牙周洁治、刮治及根面平整的器械。
- 了解确定和处理全身因素和局部因素的重要性。
- 了解确定和处理局部解剖因素和医源性因素的重要性。
- 了解目前牙周辅助治疗方法中的全身和局部用药原则，懂得如何根据临床实际情况选择最适合的产品。
- 熟悉牙周支持疗法的目标及其实现的途径。
- 重视患者依从性问题，懂得如何辨别并纠正依从性不佳的问题。

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致　谢

感谢以下人员提供的帮助：感谢纽卡斯尔牙科医院影像科的Janet Howarth女士提供的专业影像照片；感谢David Jacobs博士提供图5-1；感谢Shakil Shahdad博士提供图5-2和图5-3；感谢Robert Wassell博士提供图5-5；感谢Dean Barker博士提供图5-8～图5-10；感谢登士柏英国公司提供图3-4，图3-6，图3-7，图3-9，图3-10和图3-14。感谢Iain Chapple教授提供图3-15，图5-7和图5-11，感谢Suzanne Noble女士让我们使用图3-16，图3-17和图3-18。以下图片已经获得作者和出版社的许可：图2-4（Heasman，Millett，Chapple．健康和疾病状态下的牙周组织及正畸学．牛津：牛津大学出版社，1996），图5-5（Barnes，Walls．老年口腔医学．牛津：Wright，1994），图5-20（Heasman，Preshaw，Smith．牙周病学彩色图谱．伦敦：Churchill Livingstone，1997）。感谢Iain Chapple和Damien Walmsley提供封面照片；同时也要感谢George Warman和Dental Update出版社允许我们再次使用这些照片。

Heasman教授向在本书起草阶段提供帮助的Lynne，Sophie和Christopher致谢。Preshaw博士感谢他的妻子Sarah的帮助和支持。Pauline Robertson女士也对她丈夫Brian以及她家庭的支持表示感谢。

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第 *1* 章　非手术治疗的目的及临床疗效

The Goals and Clinical Outcomes of Non-Surgical Treatment

目　的

本章旨在简要介绍牙周非手术治疗的目的，并回顾其临床疗效。

Aim

This chapter aims to outline the goals of non-surgical periodontal treatment and to provide an overview of the clinical outcomes that are expected following treatment.

要　点

从业人员在阅读完本章后，应对以下方面内容有所了解：

- 牙周非手术治疗的愈合过程。
- 口腔卫生宣教和牙周器械处理两阶段治疗后的临床情况。
- 非手术治疗的局限性。

Outcome

After reading this chapter the practitioner should have an understanding of:

- the healing events that follow non-surgical treatment
- the magnitude of the clinical changes and outcomes expected following the hygiene (or initial) and instrumentation (or corrective) phases
- the limitations of non-surgical treatment.

牙周袋——牙周的病理环境

牙周袋是病理性加深的龈沟，袋内壁为溃疡的上皮衬里，根方为结合上皮，剩余的壁由病变根面（牙周治疗

The Periodontal Pocket – A Pathological Environment

A periodontal pocket is a pathologically deepened gingival crevice. The lateral and apical boundaries of the pocket are the ul-

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的重点部位）组成。

cerated epithelial lining of the pocket wall and the junctional epithelium respectively. The remaining “wall” of the defect comprises thc diseased root surface - the “target” for periodontal treatment.

病变根面受到龈下牙石和菌斑的感染，且含有持续与宿主防御系统相抗争的致病因素。牙菌斑为一种生物膜，是由附着在牙齿光滑表面的微生物实体组成。细菌附着于牙面上，并产生胞外多聚物基质使得细菌间互相粘附。微菌落形成后许多新的菌种参与了生物膜组成，随后生物膜内即含有多种多样的细菌及其代谢状态。龈沟液（gingival crevicular fluid，GCF）可从许多通道流出，向细菌提供营养，并将一些废物排泄出来。菌斑生物膜是可以发展的，细菌能够繁殖并在根面其他地方定植形成新的菌落。

The diseased root surface is contaminated with subgingival calculus deposits and a layer of dental plaquc, which contains the periodontal pathogens that constantly challenge and compromise the host's defence mechanisms. Dental plaque is now regarded as a biofilm, which essentially is an organised community of bacteria that forms on a non-shedding surface such as a tooth. Bacteria attach to the tooth and produce a matrix of extracellular polymers to help bind them together. Microcolonies form and new species join the biofilm which then contains diverse species and metabolic states. Gingival crevicular fluid (GCF) flows through the many channels in the aggregation to provide nutrients and to remove some of the waste products. The biofilm is viable and bacteria can proliferate to establish new colonies on other parts of the root surface.

生物膜中的绝大多数细菌是厌氧菌，厌氧菌的胞壁含有大量的内毒素脂多糖（lipopolysaccharide，LPS）。研究表明绝大多数LPS只是松散地粘于根面或与根面连在一起，尤其是在不规则根表面、根面凹槽或吸收陷窝等处更是如此，但少量的LPS即可能导致

The majority of bacteria in an established biofilm are recognised, anaerobic organisms with cell walls containing powerful lipopolysaccharide (LPS) based endotoxins. Studies have shown that the vast majority of LPS is only loosely bound to, or associated with, the root surfaces al-

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根面污染。根面的龈下结石可能也被 LPS 污染。图 1-1 为病变根面示意图。

though a small percentage of the total LPS may cause subsurface contamination, in particular at sites of root surface irregularities, root grooves or resorption lacunae. Subgingival calculus on the root surface may also be contaminated with LPS. Diagrammatic representations of a diseased root surface are shown in Fig 1-1.

非手术治疗的目的

The Aims of Non-Surgical Treatment

非手术治疗的总体目的是创造一个与牙周组织生物相容的环境，要想达到这一目的所要做的工作有：

The overall aim of non-surgical treatment is to create an environment that is biologically compatible with healing of the periodontal tissues. This is most likely to be achieved by:

- 通过去除根面的 LPS/ 内毒素来

- decontamination by removing LPS/

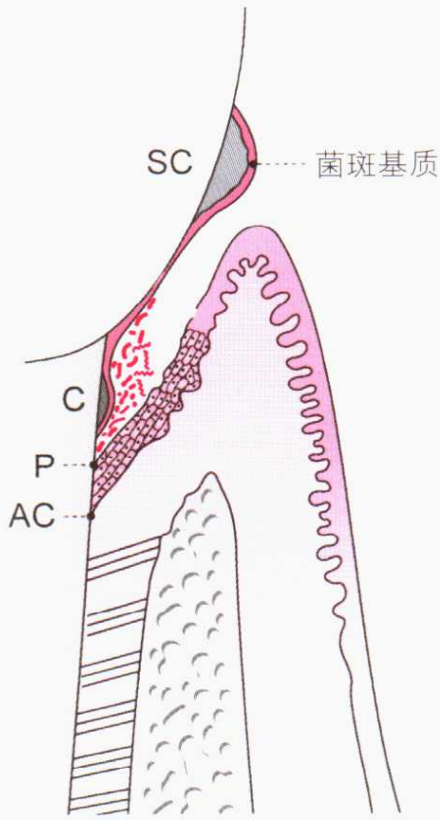


图 1-1　慢性牙周炎时牙周袋病变情况示意图。溃疡的袋上皮沿着根面向根方爬行。龈上、下牙石的表面覆盖一层菌斑，龈下菌斑为生物膜，其表面还松散地附着微生物群体

SC：龈上牙石；C：龈下牙石；P：牙周袋的底部；AC：结合上皮最根方的细胞

Fig 1-1 Diagrammatic representation of a periodontal pocket for a patient with chronic periodontitis. The pocket epithelium, which is ulcerated, has migrated down on to the root surface. Calculus deposits are present both supra- and subgingivally and these deposits are covered with a layer of plaque. The subgingival plaque may also be regarded as a biofilm with a complex population of loosely adherent micro-oganisms on its surface

SC, supragingival calculus. C, subgingival calculus. P, the most apical extent of the periodontal pocket. AC, the most apical cell of the junctional epithelium

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消除感染。
• 干扰或去除根面生物膜。
• 去除根面的龈下结石。

实验研究表明温和的水流能去掉约39%的LPS，而根面洗刷则可进一步去掉60%。这提示非手术治疗的口腔卫生宣教阶段有助于扰乱菌斑生物膜、并去除袋内约99%以上的内毒素，上述结果前提为假设患者在清洁牙齿时器具能到达牙周袋的整个深度，但对于深度超过5mm的牙周袋，这是很难达到的。实际上，牙周袋越深，没被干扰的菌斑生物膜就可能剩得越多。

因此，根面的器械处理（以往称根面平整）是很有必要的。根面器械处理这一术语是用来描述去除内毒素、扰乱菌斑生物膜及去除龈下牙石的整个程序方法（亦称为根面清理）。用超声器械可以去尽根面所有可探查到的龈下牙石，且可去掉牙周袋内松散的内毒素及根面表层坏死的牙骨质（图1-2）。研究表明超声器械最有效的应用在于其可与根面多方位接触。虽然那种根面要刮到硬且光滑为止的观念已基本淘汰，但是对于一些难以去除的龈下牙石仍需在根面施加较大的压力。

endotoxins from the root surface
• disrupting and eliminating the biofilm from the root surface
• removing the bulk of subgingival calculus from the root surface.

Laboratory studies have shown that a gentle stream of water can remove about 39% of the LPS whilst brushing the root surface eliminates a further 60%. This suggests that the hygiene phase of non-surgical treatment may be instrumental in disrupting the biofilm and eliminating up to 99% of endotoxins in the pocket. Such a hypothesis of course makes the assumption that the patient is able to access the entire depth of the pocket during cleaning. This is seldom achieved for pockets that are greater than 5mm in depth. Indeed, the deeper the pocket, the more residual, undisturbed biofilm is likely to remain.

The need for professional intervention is, therefore, crucial and this includes root surface instrumentation, a term which is used in preference to root planing. Root surface instrumentation describes the procedure that is necessary to eliminate endotoxins, disrupt the biofilm and, when present, remove subgingival calculus from the root surface (also called root surface debridement). Root surfaces that have no detectable subgingival calculus may be instrumented by passing an instrument such as an ultrasonic sealer lightly over the surface.

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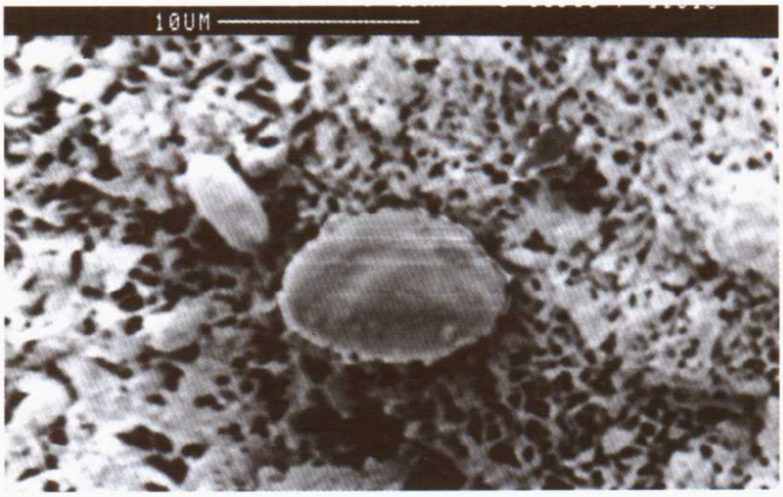


图1-2 扫描电镜可见牙周炎患牙根面多孔的、坏死的牙骨质

Fig 1-2 Scanning electron microscope view of a periodontally involved root surface showing porous and necrotic cementum

This will remove the loosely associated toxins and the majority of the outermost, necrotic cementum on the root surface (Fig 1-2). Research shows that the most effective use of ultrasonic instruments involves multiple light passes of the instrument over the root surface. The presence of tenacious, subgingival calculus will, however, necessitate the use of greater pressure to the root, although the belief that the root surface has to be meticulously "planed" until it is hard and smooth is now largely outdated.

牙石的清除

牙石本身并不会导致牙周疾病，但由于下列几个原因而被看作是牙周病的促进因素：

- 所有牙石表面均覆盖一层菌斑。
- 龈上牙石妨碍刷牙及牙间隙的清理。

Elimination of Calculus

Calculus is not the cause of periodontal disease, but may be regarded as a contributory factor, for several reasons including:

- all calculus has a coating layer of dental plaque
- supragingival calculus impedes toothbrushing and interdental cleaning

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- 龈下牙石使龈下清洁变得困难，且在菌斑生物膜形成初期可作为细菌定植的中心。
- 龈下牙石能够吸收细菌内毒素。
- 龈上、下牙石可能使牙周探诊产生误差。

基于上述原因，尽管某些孤立残留的龈下牙石可能已经不影响牙周愈合，但尽可能地去除牙石仍然很重要。一些研究结果亦与此一致，表明即便在牙周手术中可直视情况下也难将根面的牙石完全绝对去尽。探诊深度超过5mm的牙周袋很难保证没有牙石和菌斑，因此非手术治疗时不应忽略根面残留的沉积物，而应尽量重视它，这一点很重要。

全口抗感染的概念

通过全口抗感染这一牙周疾病新疗法的介绍，人们逐渐认识到消除那

- subgingival calculus may act as both a barrier to subgingival cleaning and a focus for the colonization of bacteria during the first stage in the formation of a biofilm
- subgingival calculus may absorb bacterial endotoxins
- supra- and subgingival calculus may impede the passage of periodontal probes, thereby falsifying borderline probing depth measures.

For these reasons, it is important to try to remove as much of the calculus as possible, although some residual, isolated deposits of subgingival calculus are likely to be compatible with periodontal healing. This observation is consistent with studies that have shown that even under optimal conditions of access during periodontal surgery absolutely calculus-free root surfaces following root surface instrumentation are hardly ever achieved. With the understanding that pockets with probing depths of >5mm are exceptionally difficult to render plaque and calculus free, it is almost certain that residual deposits are more likely to be the rule rather than the exception with a non-surgical approach.

The Concept of Full-Mouth Disinfection

The importance of eliminating the biofilm and bacteria that have freedom of

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些能在口腔中自由活动且能作为牙周感染和再感染病因的细菌和菌斑生物膜的重要性。全口抗感染包括了传统的根面沉积物的清除，但建议在随后24h内完成2次以上的复诊，口腔卫生措施的宣教也应在复诊期间完成。提出这种疗法是因为许多牙周潜在致病菌如牙龈卟啉单胞菌、伴放线放线杆菌也存在于一些非牙周部位，如舌背、口腔黏膜、唾液或扁桃体表面，若不能迅速地将这些部位所有的细菌清除掉，那么治疗过的牙周袋可能会被再感染。因此复诊次数越少，来自未治疗区域再感染的机会就越少。

根面器械处理结束后即可用不同剂型的葡萄糖酸氯己定来辅助抗感染治疗（表1-1），但是尚无明显证据支持氯己定在器械处理过程中对全口抗感染的辅助作用具有临床意义。

movement around the oral cavity, and are the cause of periodontal infections and re-infections, has been recognised by the introduction of full-mouth disinfection as a novel treatment strategy for periodontal diseases. Full-mouth disinfection involves the conventional removal of root surface deposits, usually over two visits within 24 hours of one another. Instruction in oral hygiene procedures is also given at one or both visits. This treatment recognises, however, that many of the potent pathogens, such as Porphyromonas gingivalis and Actinobacillus actinomycetemcomitans, are also commonly found at non-periodontal sites such as on the dorsum of the tongue, on the oral mucosa, in saliva, or on the mucosal surface of the tonsils. Re-infection of treated pockets is, therefore, likely unless an attempt is made to eliminate the organisms from all of these niches and as quickly as possible. The fewer the number of visits, the less chance there is for re-infection from (as yet) untreated sites.

Different preparations of chlorhexidine gluconate have also been used in an attempt to achieve adjunctive disinfection immediately after the completion of root surface instrumentation (Table 1-1). There is little evidence, however, to support the clinical value of the adjunctive use of chlorhexidine over mechanical instrumentation alone during full-mouth disinfection.

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表 1-1 根面器械处理后不同剂型的葡萄糖酸氯己定辅助全口抗感染治疗

Table 1-1 Preparations of chlorhexidine gluconate that have been used to help achieve full-mouth disinfection after root surface instrumentation

剂 型	应 用
1%的凝胶	用于刷洗舌背（1min)
0.2%漱口液	漱口 1min
0.2%口腔喷雾剂	喷于舌部
1%的凝胶	在 10min 内连续进行 3 次龈下冲洗
0.2%漱口液	家庭用，2/d，每次 1min，用 2 个月
0.2%口腔喷雾剂	喷于舌部，2/d，用 2 个月

牙周治疗后的伤口愈合

牙周袋治疗后愈合的一个重要指标是探诊深度的减少，这种减少很大一部分是由于牙龈炎症减轻导致牙龈组织退缩以及新的长结合上皮的形成（图 1-3）。

龈上洁治以及患者通过改进菌斑控制方法达到牙菌斑的预防和清除可减少细菌对宿主的威胁，从而使牙龈急性炎症得到缓解。这些变化在 1～2 周内发生，以牙龈红肿消退、出血减少为特征（图 1-4）。

有效的根面器械处理和龈下菌斑

Healing Following Periodontal Treatment

One of the principal signs of a healing pocket is the reduction in probing depth that follows treatment. This reduction is largely a result of the resolution of gingival inflammation leading to shrinkage of the gingival tissues and the formation of a new, longjunctional epithelium (Fig 1-3).

Supragingival scaling, prophylaxis and the removal of dental plaque as a consequence of improved plaque control by the patient reduce the bacterial challenge to the host and, as a result, there is a resolution of the acute inflammatory lesion in the gingival tissues. These changes may occur within 1-2 weeks and are characterised by reductions in gingival swelling, redness and gingival bleeding (Fig 1-4).

Efficient root surface instrumentation

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图 1-3　图 1-2 中的根面经过超声刮治后，可以看到器械引起的凹坑，但根面相对光滑

Fig 1-3　The root surface shown in Fig 1-2 has been instrumented using light application of an ultrasonic sealer. The root surface is now relatively smooth, although there are noticeable indentations as a result of the instrumentation



图1-4　上颌切牙唇侧颈部带状牙石，该牙石具有典型的龈下牙石的特点，但由于口腔卫生宣教阶段治疗后牙龈炎症消退而变成龈上牙石。由于牙石表面有菌斑，故龈缘仍有炎症

Fig 1-4　A band of calculus on the labial aspect of a maxillary incisor. This calculus has the typical appearance of a subgingival deposit. This deposit has now become supragingival due to resolution of gingival inflammation following hygiene-phase therapy. Note that the free gingival margin is still inflamed because the calculus has a surface layer of dental plaque

生物膜的破坏为根面创造了一个良好的长结合上皮生长的生物学环境。新的上皮通过半桥粒与根面牙骨质连接，这些上皮细胞来源于根面残留的健康结合上皮以及那些具有再生潜能的牙周袋上皮。当细菌被清除后，上述这些因素有助于伤口愈合。根面器械处理几天后，位于牙周袋最根方的上皮即

and disruption of the subgingival biofilm will create a root surface that is biologically compatible with the formation of the long junctional epithelium. The new epithelium adheres to the root surface through a hemidesmosomal attachment between the cells and the surface cementum. These epithelial cells are derived from the remain-

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开始附着于根面，2～3周内不断往冠方生长，随后牙龈及牙周胶原纤维也不断成熟。虽然牙周主纤维中新生的结缔组织没有与根面附着，但上述这些变化将最终通过组织重建进一步使探诊深度减少。

ing apical healthy junctional epithelium and some of the pocket epithelium that retains the potential for regeneration. This contributes to the healing process once the bacterial challenge to the host is removed. The attachment of epithelium begins within a few days of root surface instrumentation at the most apical extremity of the pocket and then progresses coronally over 2-3 weeks. Maturation of the gingival and periodontal collagen fibres then follows. Although there is no new connective tissue attachment of principal periodontal fibres to the root surface, these later changes enhance the integrity of the tissues to further reduce the probing depths.

牙周治疗后肿胀的牙龈消退会导致根面部分暴露，因此应将这部分根面列入牙周支持治疗计划内，如定期复查、氟化物的使用，甚至必要时使用脱敏药物（见第7章）。牙龈经治疗后形态多不规则，这可能会影响菌斑控制或给那些已熟练掌握牙间及龈下清洁方法的患者造成不习惯（图1-8）。

The reduction of gingival swelling and enlargement leads to supragingival exposure of root surfaces that have to be maintained as part of the supportive periodontal care programme: regular prophylaxis, application of fluoride varnish and, if necessary, desensitising agents (Chapter 7). The post-treatment morphology of the gingival tissue is often irregular and may further complicate plaque control and provide another challenge to patients who are already adept at interproximal and subgingival cleaning (Fig 1-8).

非手术治疗的临床疗效

Clinical Outcomes Following Non-Surgical Treatment

不管慢性牙周炎多严重、牙周袋

It is now accepted that non-surgical treat-

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有多深，非手术治疗对于依从性良好的牙周炎患者都可能有所帮助。20 世纪80年代的首次临床系列纵向研究表明：牙周炎患者经过非手术治疗之口腔卫生宣教及器械处理两阶段治疗后可获得预期疗效（图 1-6）。

ment for a motivated and compliant patient is likely to result in some improvement in periodontal status irrespective of the severity of chronic periodontitis and the probing depths at diagnosis. It was only during the 1980s that data were reported in a series of classical, longitudinal clinical trials, to document for the first time the changes that might be expected following both the hygiene and instrumentation stages of non-surgical management (Fig 1-6).



图 1-5　辅助全口抗感染的葡萄糖酸氯己定的不同剂型（漱口液，口腔喷雾剂和凝胶）

Fig 1-5　Preparations of chlorhexidine gluconate used for full mouth disinfection: mouthwash, spray and gel

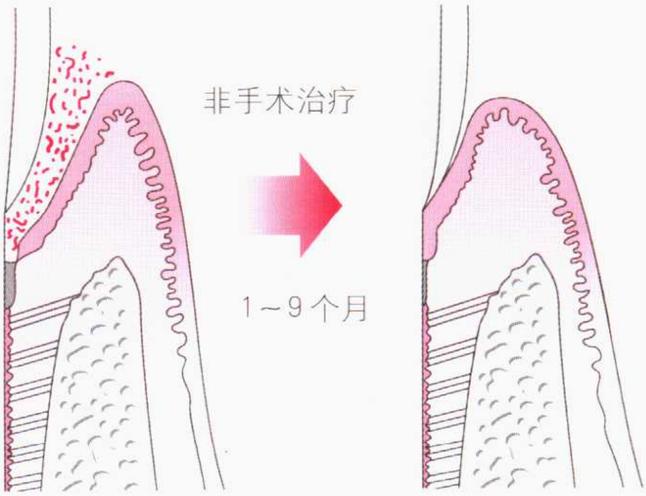


图 1-6　牙周非手术治疗后伤口愈合。随着致病菌斑的清除，牙龈炎症消退（伴有牙龈退缩），上皮细胞与根面形成半桥粒连结。此愈合过程可能需 9 个月以上

Fig 1-6　Diagrammatic representation outlining the healing mechanisms after non-surgical therapy. Following removal of the aetiological dental plaque, there has been resolution of gingival inflammation (and gingival shrinkage), and hemidesmosomal attachment of epithelial cells to the biologically compatible root surface. This healing process may take up to nine months to complete

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口腔卫生宣教与器械治疗两阶段的比较

1983 年 Cercek 及其同事在 Loma Linda大学比较了慢性牙周炎患者通过菌斑控制和根面器械处理后的效果(图 1-7)。口腔卫生宣教(包括每天刷两次牙及牙线、牙间刷的合理使用)临床疗效如下:

- 菌斑指数显著下降，浅袋的菌斑指数由原先的 60% 下降到

Hygiene versus instrumentation phases

The study by Cercek and his colleagues at Loma Linda University in 1983, reported the relative effects of plaque control and root surface instrumentation on patients with chronic periodontitis (Fig 1-7). The hygiene phase comprised twice-daily toothbrushing and the use of floss and interdental brushes where appropriate. The clinical effects were:

- significant reductions in plaque score within one month of treatment. Ini-



图 1-7　慢性牙周炎治疗效果。a. 示慢性牙周炎患者的牙龈炎症；b. 示同一患者经刷牙指导两周后的情况：龈上牙石已经被清除（此时，牙间清洁工具并未被推荐），但仍存在着一些龈上菌斑（虽然菌斑已减少到一定水平，龈炎已得到控制）

Fig 1-7　a. Gingival inflammation is present in a patient with chronic periodontitis; b. The same patient two weeks later following instruction in toothbrushing. Supragingival calculus has also been removed but, at this stage, methods for interdental cleaning have not been introduced. Some supragingival plaque deposits remain, although the level of plaque control has improved considerably and, as a result, the aggressive nature of the gingival inflammation has resolved

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5%，而深袋则由约90%下降到75%～80%，下降了10%～15%。

- 3个月内BOP由70%降到40%。
- 牙周袋深度平均下降约0.5mm。
- 临床附着少许丧失。

由于牙刷及牙线难以进入深袋（≥6mm），故其出血指数远高于浅袋（≤3.5mm），但深袋位点探诊深度的改善程度却高于浅袋。另外深袋位点与浅袋位点相比更容易发生急性炎症及牙龈肿胀，因此在菌斑控制后牙龈炎症消退，就更容易发生牙龈退缩。深袋位点由于袋底缺乏有效的菌斑控制易发生少许附着丧失（约0.1mm），而浅袋位点的附着丧失是由于牙齿清洁时创伤引起的。

根面器械处理后（包括运用超声波根面处理）的研究发现：

tial scores of 60% at shallow pockets were reduced to 5% whereas the deeper pockets with plaque scores of around 90% showed reductions of 10-15%

- a reduction of BoP from 70% to 40% within three months
- an average reduction of probing depth of approximately 0.5mm
- some loss of clinical attachment.

The bleeding scores were reduced to a greater extent in shallow pockets (≤ 3.5 mm) than in deeper pockets (≥ 6mm) because of the limited access of brushes and floss to those deeper sites. The deeper sites did, however, demonstrate greater reductions in probing depths than the shallow sites. Deeper sites tend to have more acute inflammation and swelling of the gingiva when compared to the shallower sites and, therefore, have more potential for gingival recession following improvements in plaque control. A slight loss of attachment (about 0. lmm) tended to occur at the deeper sites because of the lack of effectiveness of plaque control measures at the base of pockets. Loss of attachment at the shallower sites occurred because of local trauma from improved tooth cleaning measures that are able to access the depth of the pockets.

Further changes followed the instrumentation phase that comprised one episode of root surface instrumentation using an ul-

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• 深袋的探诊深度下降了1mm以上，与浅袋相比有显著差别。

•深袋的附着水平有明显改善，但浅袋（治疗前为≤3mm）却更易发生附着丧失。

这些数据清楚地表明在口腔卫生宣教阶段的治疗也有一定疗效，但其作用可能有限（尤其对于＞4mm的袋），若要达到满意的临床效果则要进行根面器械处理。

Badersten 研究

20世纪80年代，Anita Badersten及其同事在Loma Linda大学报道了中到重度慢性牙周炎患者经过非手术治疗后的牙周愈合过程及临床疗效。虽然该研究并没有将口腔卫生宣教和器械处理两个阶段分开进行单独详细的评价，且涉及的牙位仅有切牙、尖牙和前磨牙，但该研究是第一份牙周炎患者经非手术治疗后临床疗效的详细报告（图1-7～图1-9）。结果见表1-2。

trasonic sealer. These observations were:

• continued reductions in probing depths of up to lmm with the initially deeper pockets showing greater reductions than the shallower pockets
• improved attachment levels for the initially deep pockets but not for the shallower pockets (≤ 3mm prior to treatment), which are susceptible to loss of attachment following both the hygiene and instrumentation phases.

These data show clearly that clinical improvement does occur following the hygiene phase of treatment, but the changes are likely to be limited, in particular in pockets of 4mm or greater. If the clinical changes are to be maximised then root surface instrumentation is essential.

The Badersten studies

In the 1980s, Anita Badersten and her colleagues, at Loma Linda University, reported a series of clinical trials that studied the healing events and clinical outcomes following non-surgical treatment in patients with moderate and advanced chronic periodontitis. These studies did not allow a detailed, separate interpretation of the effects of the hygiene and instrumentation phases and only incisors, canines and premolars were included in the studies. Nevertheless, despite these limitations, the studies provided the first, in-depth report

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图1-8 上颌切牙和尖牙间隙处的牙龈形状不规则，此处牙龈虽发生退缩，但患者可以更容易用那些牙间清洁工具，以保持高水平的菌斑控制

Fig 1-8 An irregular gingival morphology at interproximal sites between maxillary incisors and canine. The gingival shrinkage that has occurred will make it easier for the patient to use interdental aids to maintain a high level of plaque control, even though the gingival morphology is irregular

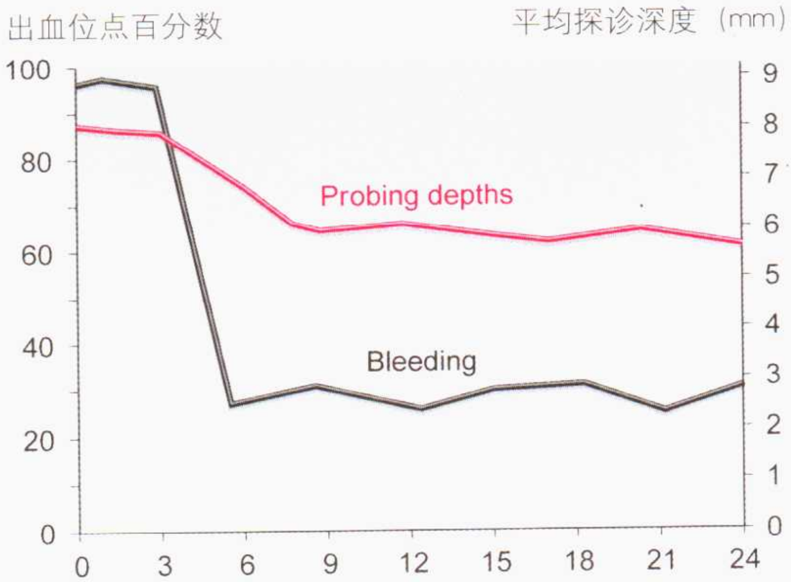


图 1-9 重度牙周炎患者经牙周非手术治疗后探诊出血和探诊深度的理想愈合情况。治疗后头6个月，出血位点的百分数从100%降到20%，平均探诊深度由8mm降到5mm。需注意的是一个5mm的牙周袋并没有出血，其应通过牙周支持治疗予以保持。若治疗后牙周袋仍会出血则需仔细地探测是否有残留的牙石及菌斑沉积，若有，则需再治疗（Badersten, Nilveus, Egelberg 1984）

Fig 1-9 Graph showing expected resolution of bleeding on probing and probing depths following non-surgical treatment in patients with advanced chronic periodontitis. Percentage of bleeding sites falls from 100% to approximately 20% during the first six months following treatment. Mean probing depths may have reduced from 8mm to approximately 5mm. Note that a 5mm pocket that does not bleed following probing should be maintained through a programme of supportive periodontal care. Pockets that continue to bleed following treatment should be inspected carefully for residual calculus and plaque deposits and, if present, retreat-ment will be indicated (after Badersten, Nilveus, Egelberg 1984)

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表1-2 中到重度慢性牙周炎患者的切牙、尖牙和双尖牙经过牙周非手术治疗后的临床疗效和一些主要的结论

Tdble 1-2 Principal conclusions and outcomes following non-surgical trestment of incisors, canines and premolars in patients with moderate and advanced chronic periodontitis

中度牙周炎（平均探诊深度4～7mm）	重度牙周炎（探诊深度超过12mm）
一个月内菌斑分数由70%下降到小于12%	菌斑分数显著下降，探诊深度减少0.5mm
根面平整完成5个月后，出血分数从90%下降到15%	根面平整后可使探诊深度再减少1.2mm
深袋比浅袋更易见探诊出血	治疗后6～9个月牙周状况明显改善
洁治阶段探诊深度下降0.5mm，而根面平整后探诊深度共下降1.5mm	深袋比浅袋更易见探诊出血
牙周袋深＞6mm比4.0～4.5mm袋探诊深度下降更多，并获得更多的附着	深袋位点治疗后可获得更多的附着，但牙龈退缩显著，当然深度也比浅袋要深些
虽然绝大部分牙龈退缩发生于治疗后头2～3个月，但治疗后一年平均退缩仅有1.5mm	
临床显效多始于治疗后5个月内	
超声器械治疗速度大大快于手用器械，且临床疗效二者无差别	

of clinical outcomes following non-surgical treatment of moderate and advanced chronic periodontitis (Figs 1-7 to 1-9). The principal outcomes and conclusions are shown in Table 1-2.

牙周非手术治疗的循证医学

Hung和Douglass对牙周根面器械处理后的效果进行了Meta分析，这种分析可综合多中心的研究结果，从而对某一治疗方法的临床疗效作出整体

An evidence base for non-surgical treatment

Hung and Douglass published a meta-analysis of the effects of root surface instrumentation. This type of analysis allows the results from several studies to be

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的判定。由于是在研究后才有特定的纳入标准，因此仅有九项研究纳入分析，而其他许多研究被排除在外，例如标准之一为基线检查时探诊深度应划分为浅（1～3mm）、中（4～6mm）和深（> 7mm）三度。

combined so that overall trends of clinical outcomes can be identified. Nine studies were included in the analysis because specified inclusion criteria were set after the research was carried out and, as with any review of this nature, many studies were excluded. For example, one inclusion criterion was that probing depths had to be stratified into shallow (l-3mm), moderate (4-6mm) or deep (>7mm) at the outset.

分析后的总体论点与 Cercek 及 Badersten 研究结果一致：

The summary points from the analysis were consistent with the findings of the Cercek and Badersten studies:

- 对于浅袋，根面器械处理后改善的程度不明显。
- 根面器械处理后浅袋会丧失部分临床附着。
- 4～6mm 的袋经治疗后袋平均减少约 1 mm，临床附着可增加 0.5mm。
- 深袋（> 7mm）经治后袋深平均减少约 2 mm，临床附着增加 1mm。

- There is little significant improvement following root surface instrumentation of shallow pockets.
- Shallow pockets lose some clinical attachment after instrumentation.
- Pockets of 4-6mm show average probing depth reductions of about lmm and 0.5mm gain of attachment after treatment.
- Deep pockets show average probing depth reductions of about 2mm and lmm gain of attachment after treatment.

小　结

本章回顾了非手术治疗的目的及纵向临床研究的效果。这些临床效果应被视为牙周炎经非手术治疗后可能达到的，但对于许多影响疗效的混杂因素，临床医师应有清醒的认识，这些

Summary

This chapter has reviewed the aims of non-surgical treatment as well as the clinical outcomes that have been documented in longitudinal clinical trials. These outcomes should be regarded as the likely con-

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因素有：

- 患者就诊的动机。
- 患者的依从性。
- 全身危险因素。
- 局部危险因素。
- 对牙周病的基因易感性。
- 细菌本身的特性。

众所周知，吸烟是牙周病最常见的危险因素之一，非吸烟者的临床治疗效果要好于吸烟者，但本章所参考的文献均未考虑到吸烟在慢性牙周炎发病及其治疗效果中的潜在影响。

sequences of non-surgical treatment. It is essential, however, that the clinician appreciates that there are additional confounding factors that will have a significant effect on the outcome of treatment. These factors must be assessed on an individual patient basis, including:

- patient motivation
- patient compliance
- medical risk factors
- local risk factors
- genetic predisposition to periodontal disease
- the nature of the bacterial challenge.

It is widely recognised that smoking is one of the most prevalent risk factors for periodontal diseases. The magnitude of the clinical change following periodontal treatment in smokers is inferior to the clinical outcome in ex-smokers and those who have never smoked. None of the studies that have been reported in this chapter recognised the potential influence of smoking on chronic periodontitis and its treatment.

临床要点

- 根面器械处理的目的是去除根面的内毒素和根面的菌斑生物膜。
- 牙周治疗时应尽可能地将龈下牙石去除干净，但有一些残留的小沉积物可能并不影响伤口

Conclusions of Clinical Importance

- The aim of root surface instrumentation is to remove endotoxins and the biofilm from root surfaces.
- As much subgingival calculus as possible should be removed from root surfaces, but some small residual de-

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愈合。

posits may be compatible with healing.

• 24～48h 内进行 2 次以上的就诊有助于全口抗感染。

• Full-mouth disinfection can be used to provide intensive treatment over two visits within 24-48 hours.

• 牙周袋的愈合表现为炎症的消退和长结合上皮的形成。

• Pockets heal by resolution of inflammation and the formation of a long junctional epithelium.

• 牙周治疗后，深袋的探诊深度减少程度大于浅袋。

• Deep pockets show greater reduction of probing depths following treatment than shallow pockets.

拓展阅读
Further Reading

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第 2 章　口腔卫生宣教阶段的治疗

Hygiene Phase Therapy

目　的

本章综合回顾了目前控制牙菌斑的化学和机械方法。

要　点

从业人员在阅读完本章后，应当:

- 熟悉牙刷的设计及牙间清理工具的内容。
- 了解化学控制菌斑的适应证。
- 了解一些常见的用于控制菌斑的漱口水。

菌斑控制步骤

家庭保健、菌斑控制程序和口腔卫生宣教阶段治疗是牙周非手术治疗中极为重要的组成部分。要想使牙周炎得到控制，菌斑必须减少到一定程度，但方法和步骤应因人而异，要求患

Aim

To provide a comprehensive overview of the methods that are available for the mechanical and chemical control of dental plaque.

Outcome

After reading this chapter the practitioner should:

- be aware of the range of toothbrush designs and interdental cleaning aids that are available
- understand the indications for using chemical plaque control
- have knowledge of the range of generic mouth rinses that are available for chemical plaque control.

Plaque Control Programmes

Homecare, plaque control programmes and hygiene phase therapy are crucial components of non-surgical periodontal therapy. Programmes should be based on individual patient needs in order to achieve

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者牙列中没有菌斑是不现实的。实际上，许多临床研究已证实：即使通过严格的口腔卫生宣教及定期菌斑控制，绝大多数患者仍有10%～15%的牙面存在菌斑沉积。对于绝大多数慢性牙周炎患者来说，口腔清洁到这种程度也就可以了。

a level of plaque control that is compatible with a stable periodontium. It is, however, unrealistic to expect patients to achieve a plaque-free dentition. Indeed, many clinical studies have confirmed that most patients, even with intensive hygiene phase therapy and regular re-enforcement of plaque control measures, will still have about 10-15% of tooth surfaces with residual plaque deposits. For the vast majority of patients with chronic periodontitis, this standard of tooth cleaning may be found to be acceptable.

20 世纪 80 年代临床实践就已证明：要想有效控制菌斑，患者需要就诊两次；同时要求医师各花 15 分钟教会患者如何控制菌斑（表 2-1）。口腔卫生宣教阶段，充足的教育指导时间显得尤为重要，因为这样能够使患者深刻意识到自己在整个牙周病治疗过程

Clinical trials in the 1980s confirmed that plaque control may be taught effectively in two 15 minute appointments (Table 2-1). It is important that sufficient time is dedicated specifically to the hygiene phase of therapy so that patients appreciate fully that they have the key role to play in the man-

表 2-1　牙周卫生宣教阶段的典型的（两次式）菌斑控制的步骤

Table 2-1　Typical, two-visit plaque control programme as a component of hygiene phase therapy

第 1 次　首诊（用时 15min）	第 2 次　复诊（用时 15min）
向患者提供口腔保健信息，对于吸烟者应包括尼古丁对口腔健康的影响方面内容	询问吸烟者是否愿意戒烟，适时提供戒烟咨询
显示菌斑并予以评分	显示菌斑予以评分，并与原来数据比较
为选择牙刷提供建议并教其刷牙方法	发现刷牙及牙间清洁是否存在问题
教会患者如何进行牙间清洁	若有必要则应加强卫生宣教或改变宣教的方法
预防性地清除残留菌斑	对待患者要积极主动，时时对患者的努力表示肯定

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中所处的主导地位。这种地位一旦确立，就会使医患双方在口腔卫生保健实践中的行为和态度发生根本性的变化。患者必须认识到他们对牙周炎的易感性与普通人不同。因此患者还要格外重视家庭口腔保健的作用，只有这样牙周病才有可能成功治愈。

agement of their periodontal disease. This role often necessitates significant behavioural and attitude changes with respect to oral healthcare practices. In order to achieve this, patients must be made aware that they are different from the general population with respect to their susceptibility to periodontitis and, consequently, they must achieve exceptionally high standards of homecare if treatment is to succeed.

控制菌斑的机械方法

菌斑控制指去除牙面及牙龈组织的菌斑，并防止新的细菌生长。有效的菌斑控制能使牙龈炎症消退，同时它也是整个牙周治疗的基础。如果患者不进行有效的菌斑控制，疾病就会加重或复发，牙周治疗注定要失败。控制菌斑的机械方法包括使用牙刷、牙膏以及其他口腔清洁工具。菌斑控制程序应根据个体情况进行制定，同时兼顾全口、牙及位点三水平的局部危险因素，以适应不同个体的需要（见此套丛书中的第一本——《了解牙周疾病：临床诊疗过程中的评价和诊断》）。

Mechanical plaque control

Plaque control refers to the removal of plaque from tooth surfaces and gingival tissues, and prevention of new microbial growth. Effective plaque control results in resolution of gingival inflammation and is fundamentally important in all periodontal therapy. Periodontal treatment performed in the absence of plaque control is certain to fail, resulting in disease progression or recurrence. Mechanical plaque control is performed using toothbrushes, toothpaste and other cleaning aids. Plaque control programmes should be tailored to the requirements of individual patients, addressing their local risk factors at the whole mouth, tooth and site levels (see book 1 in this series, Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice).

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手动牙刷

传统手动牙刷在形状和大小方面有所差别，牙刷种类的选择要依据个人的偏好（图 2-1）。刷毛一般由尼龙丝制成，因其较软，不容易折断且不会吸水膨胀。牙刷刷毛排成束，圆头刷毛尖比平头刷毛尖更利于保护牙龈。软的刷毛柔韧性好，可达到邻面及龈下更深的地方；硬的刷毛则更可能会损伤牙龈。但是，在菌斑清除能力及是否会引起牙龈损伤方面，刷牙方法和所使用的力量比刷毛本身更重要。牙刷使用约3个月后，刷毛会出现磨损及卷曲，此时应更换牙刷。传统典型的手动牙刷应遵循以下标准：

Manual Toothbrushes

Conventional, manual toothbrushes vary in design and size, and the type of brush used is a matter of personal preference (Fig 2-1). Bristles are generally made of nylon, which is relatively flexible, resistant to fracture and does not become saturated with water. Bristles are arranged in tufts, and round-ended bristles cause fewer scratches on the gingiva than flat-ended bristles do. Softer bristles have greater flexibility, and have been shown to reach further interproximally and subgingivally. Hard bristles are more likely to result in gingival trauma. However, the technique and the force applied when brushing are more important determinants of plaque removal capability and gingival trauma than the hardness of the bristles themselves. With use, toothbrushes show signs of wear and flattening of bristles, and should be replaced approximately every three months. A typical, conventional, manual toothbrush is likely

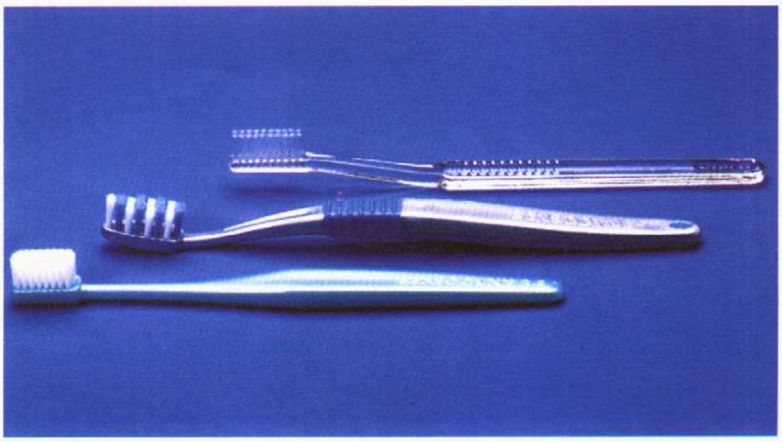


图 2-1　市场上常见的几种手动牙刷

Fig 2-1　A small number of the wide range of manual toothbrushes that are available on the market

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• 刷头长1.5～2.5cm，宽0.15～0.75cm。
• 刷毛应有四排，中等硬度，由尼龙丝制成，高度为10～12mm。

专用牙刷用于某些特殊的患者以及临床某些特定情况下的患牙（图2-2），例如：
• 儿童牙刷——刷头较小，但手柄较粗，易于握持。

• 单簇牙刷（牙间刷）——用于传统牙刷难以刷到的地方，如牙龈退缩区、根分叉以及宽大的牙间隙。

• 正畸患者专用牙刷——刷毛纵向，有V字形缺口，有利于避开固定矫治器的托槽。

to conform to the following standards:

• brush head dimensions - 1.5-2.5cm long and 0.15-0.75cm wide
• four rows of "bristles" of medium texture and made from nylon polymer filaments of 10-12mm length.

Specialist toothbrushes are available for certain patients and specific clinical indications (Fig 2-2):

• *children's toothbrushes* — which have a reduced head size and a more bulky, easier-to-grip handle
• *single tufted toothbrushes (interspace brushes)* — which can be used in areas that are inaccessible to a conventional brush, e.g. sites of gingival recession, furcations and large interdental spaces
• *orthodontic toothbrushes* — which have a V-shaped indentation along the head of bristles to accommodate the components of fixed orthodontic appliances



图2-2 几种特殊的牙刷，从左到右依次为：儿童牙刷，单簇刷毛的牙刷，正畸患者专用牙刷（用于清洁固定矫治器周边）

Pig 2-2 Specialist toothbrushes: (left to right) a child's toothbrush, a single tufted toothbrush and an orthodontic toothbrush used to clean around the components of fixed orthodondic appliances

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• 义齿专用牙刷——用于局部或全口义齿，它有一个两用刷头，刷毛锥形的部分比传统的刷毛硬度大得多。

• *denture brushes* — which may be used with partial or complete dentures. They usually have a dual-purpose head with tapered bristles that are much firmer than those of a conventional toothbrush.

电动牙刷

电动牙刷（图 2-3）的刷毛与手动牙刷相比显得更紧凑，这一特点有助于邻面刷洗清洁（尤其对于后牙来说）。刷毛簇在长方形刷头中排列成排，而在圆形头中则排成圆形，某些牙刷有紧密排列的单束刷毛，这是为刷洗邻面特制的。传统设计的刷头运动方式为平面或前后向运动，而圆刷头者，刷毛运动方式为振动。

Powered Toothbrushes

The brush heads of powered toothbrushes (Fig 2-3)tend to be more compact than those of their manual counterparts-a feature that facilitates brushing and cleaming of,in particular,posterior teeth. Bundles of bristles are arranged in rows in a rectangular head or in a circular pattern mounted in a round head. Some brushes have single, compact tufts, which are specifically designed for interproximal cleaning. The traditional design of brush head operates with



图2-3 三把具有不同刷柄和刷头形状的电动牙刷。刷毛为圆头的牙刷刷牙时运动方式为振动，而传统牙刷刷牙时运动方式为侧向或前后向运动

Fig 2-3 Three powered toothbrushes with different handle and brush head designs. The brushes with circular arrangements of bristles operate with an oscillating motion whereas the traditional design of brush bead operates with a side-to-side or back and forth motion

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电动牙刷尤其适合于那些有特殊需求的病人，如戴有固定矫治器的患者、住院患者以及需他人帮忙刷牙者。现已认为，对于菌斑控制较差的患者，可使用电动牙刷来帮助控制菌斑。大量研究表明：电动牙刷效率高于手动牙刷，这主要是由于电动牙刷机械清洁效率更高，尽管有时儿童也许会因为对使用电动牙刷有新鲜感而刷牙更认真。

当前电动牙刷有许多新功能：

- 定时装置。
- 快启动特点（这在最初使用时将会增加刷牙的力量）。
- 快慢速选择。
- 刷牙计时器（可为在口腔中某一区刷牙所花的时间提供反馈）。

a side-to-side or back and forth motion. Circular heads have an oscillating motion.

Powered brushes have previously been considered particularly beneficial for special needs patients, patients with fixed orthodontic appliances, and those who are hospitalised or institutionalised and who may need a third-party/carer to assist with toothbrushing. It is now more generally accepted that powered brushes may be advantageous for a much wider group of patients who might otherwise be unable to achieve an "acceptable" standard of plaque control. Numerous studies have confirmed that, for most patients, powered brushes are more effective than manual toothbrushes. This may be because of better mechanical cleaning, although the novelty of using a powered toothbrush may also improve compliance, especially in children.

Contemporary designs of powered toothbrushes have a number of special features that enhance their use:

- timing mechanisms
- easy start features which increase the brushing force over the first few occasions of use
- dual-speed options
- programmable pacers that provide feedback to signal the amount of time that has been spent in one part (quadrant) of the mouth.

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牙　膏

牙膏是用来辅助刷牙的，它含有磨擦剂（如硅）、水、防腐剂、香料、色素、去污剂以及治疗性药物（如氟化物）。磨擦剂（占牙膏内容物的20%~40%）有助于清除菌斑，但若刷牙用力过度，则可能导致牙表面损伤。吸烟者专用牙膏或牙粉中所含磨擦剂的比例更高，一般人不建议使用。有的化学性药物（如洗必泰）也可加入牙膏，这些药剂会在后面章节详细介绍。

Toothpastes

Toothpastes are used as aids for cleaning tooth surfaces and contain abrasives (e.g. silica), water, preservatives, flavouring, colouring, detergents and therapeutic agents (e.g. fluoride). Abrasives (approximately 20-40% of the content) enhance plaque removal, but may result in damage to the tooth surface if there is overzealous brushing. Smokers' toothpastes and tooth powders contain significantly higher proportions of abrasives and their use is not recommended. Chemotherapeutic agents (e.g. chlorhexidine) maybe added to toothpastes. These agents are discussed in more detail later in this section.

刷牙方法

绝大多数患者是采用水平方向刷牙的，这种方法无法有效地清洁龈缘及邻近区域，且可导致牙齿磨损。因此掌握一种能将所有牙面都刷干净的、系统性的刷牙方法尤为重要。Bass 刷牙法适合绝大多数患者（不管有无牙周疾病）（图2-4）。Charters法可用来轻柔地清洁牙龈，对于刚做完牙周手术的患者或患有坏死性龈炎而牙龈已不痛的患者，这是一种很好的方法。

Toothbrushing techniques

The majority of patients use a "horizontal scrub" technique, which does not clean effectively around gingival margins and can lead to tooth wear. When brushing, a systematic approach is essential, and all accessible surfaces of all teeth should be cleaned thoroughly. The Bass technique is useful for the majority of patients with or without periodontal disease (Fig 2-4). The Charters' method is useful for gentle gingival cleaning, particularly during healing immediately after periodontal surgery and for patients with necrotising gingivitis in whom the painful symptoms have resolved.

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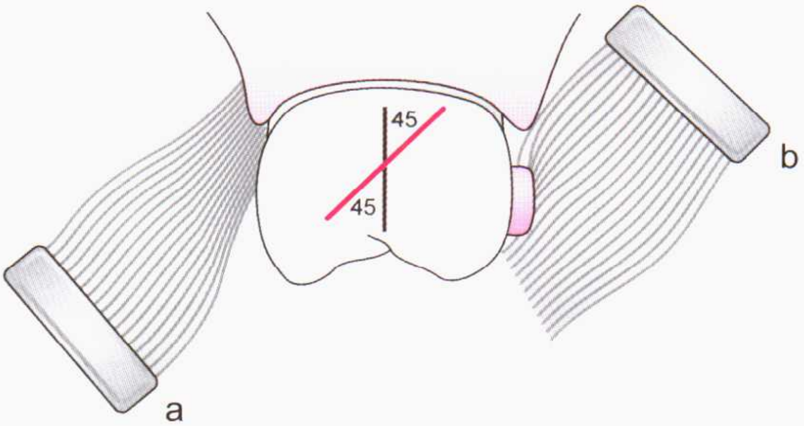


图 2-4 a. Bass 刷牙法（具体使用说明如本书文字）；b. Charters 刷牙法。刷毛方向与牙长轴成 45° 角，但刷毛指向殆面。该方法尤其适用于戴有固定矫治器的患者

Fig 2-4 a. The Bass method of toothbrushing (for explanation of technique see text); b The Charters' method of toothbrushing. This technique involves placement of the bristles at a 45° angle to the long axis of the tooth but, unlike the Bass technique, the bristles are pointed towards the occlusal surface of the tooth. This technique may be particularly useful for cleaning around orthodontic brackets in patients undergoing fixed appliance therapy

Bass 刷牙法

- 牙刷放在牙龈边缘，刷毛与牙长轴成 45° 角，刷毛尖端指向根方。
- 轻压牙刷进行短距离的颤动，刷毛的位置保持不移动（刷毛进入邻面及龈下 1mm，可使牙龈变白）。
- 约 20 次颤动后，牙刷放到另一处继续进行下一轮动作。

Charters 刷牙法

- 牙刷放在牙面上，刷毛方向与牙长轴成 45° 角，但刷毛尖端指

Bass Technique

- The toothbrush is placed at the gingival margin, with bristles orientated at 45° to the long axis of the tooth, pointing in an apical direction.
- Short vibratory strokes with light pressure are applied to the brush so that the bristles are not dislodged (the bristles reach interproximally and approximately 1mm subgingivally, resulting in gingival blanching).
- After about 20 strokes, the brush is repositioned to clean the next group of teeth.

The Charters' Method

- Toothbrush is placed on the tooth with the bristles orientated at 45° to the

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向冠方，这样刷毛侧面即对准牙龈组织。

- 然后牙刷前后短颤动，使刷毛弯曲部的侧面对着龈缘。

牙间隙清理工具

牙间隙区容易堆积菌斑，发生附着丧失。这是因为刷牙时邻面菌斑清洁较难。因此需用另外一些工具来辅助清洁邻面。

牙线和牙带

牙线多由尼龙制成，由多根尼龙纤维经螺旋或非螺旋拧成一股。牙线还有蜡质牙线和非蜡质牙线之分（蜡可使牙线易于通过邻面接触点）。目前还有一种耐磨损的、由膨体聚四氟乙烯（Teflon）材料制成的牙线。不同的牙线清除菌斑的能力无显著差异。使用牙线时，将长约45cm的牙线缠绕于两手的中指，留3～4cm长用两拇指或拇指示指撑直，使之易于通过邻面接触点。使用牙线应很小心，其上下运动范围为接触区根方和龈缘之间。对于手指不灵活的患者，牙线架（由塑料支架伸出两个突起撑住牙线）可能更适用（图 2-5）。

long axis of the tooth, pointing in a coronal direction, such that the sides of the bristles are against the gingival tissucs.

- A short back and forth vibratory motion is applied so that the sides of the bristles flex against the gingival margin.

Interproximal Cleaning Aids

Interproximal areas are particularly susceptible to plaque accumulation and subsequent attachment loss because toothbrushing does not always remove plaque from these surfaces. Additional cleaning aids are, therefore, required.

Dental Floss and Tape

Floss is usually made from nylon, and is available as a twisted or untwisted multifilament, with or without a coating of wax (wax facilitates passage beyond the contact point), as a thread or in tape form. Floss made from expanded polytetra-fluoroethylene (Teflon) materials that do not fray is also available. The plaque removal capabilities of different types of floss do not vary significantly from each other. About 45cm of dental floss should be wrapped around the middle fingers of each hand, leaving about 3-4cm stretched tightly between the thumbs, or thumb and first finger of each hand so that it can be eased care-

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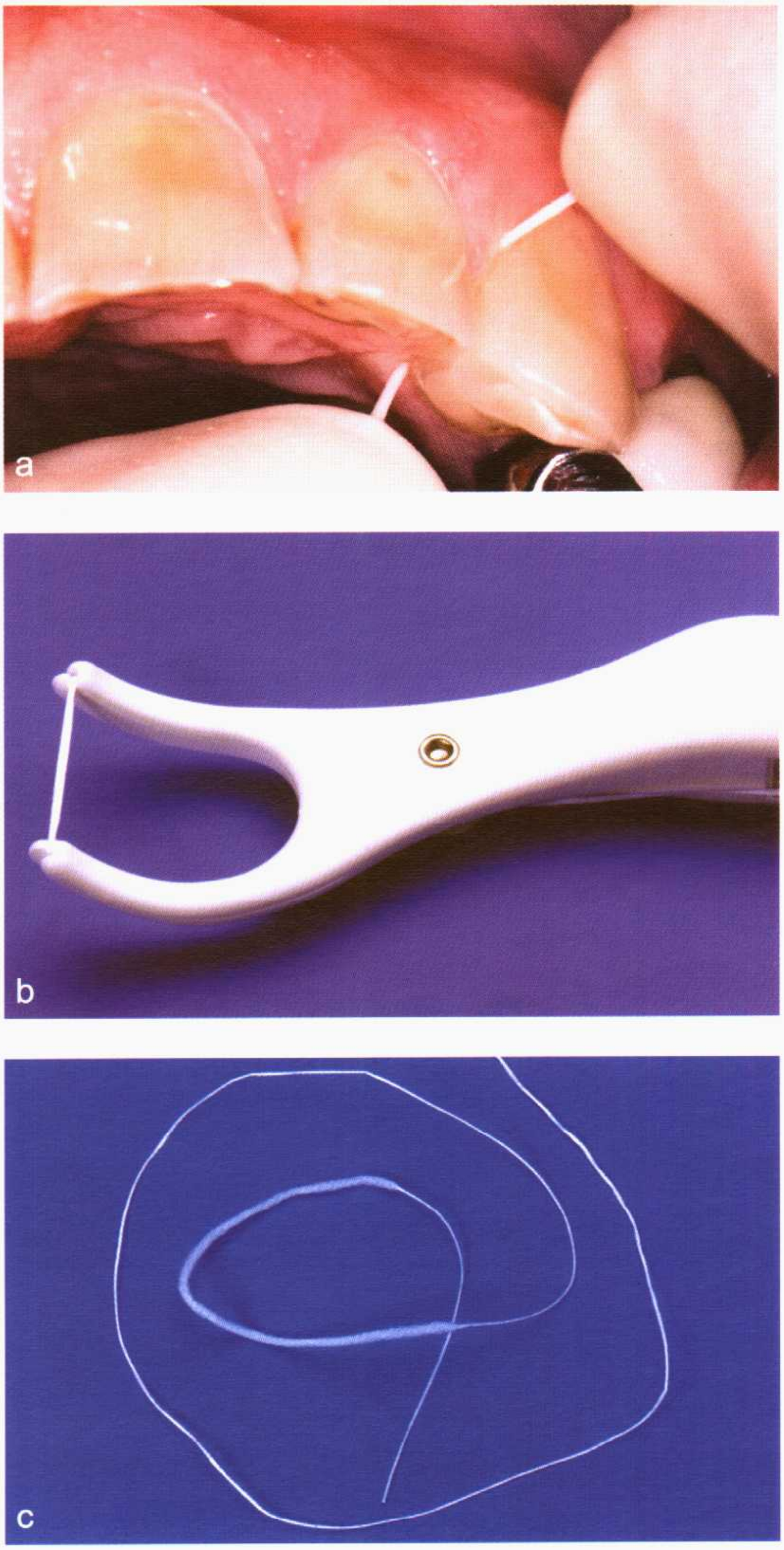


图2-5 a. 牙线在邻间隙根方的正确使用方法；b. 一些患者可能觉得这种方法使用比较困难，此时可向其推荐用牙线架；c. 超级牙线方便在天然牙与固定桥组件间的区域使用，尤其便于清洁桥体根方区域

Fig 2-5 a. Correct application of dental floss to clean interproximally beneath contact areas; b. Some patients may find this technique to be particularly difficult to master and may benefit from the use of a floss holder; c Superfloss is particularly useful for cleaning between natural teeth and the components of a bridge, particularly beneath pontics

fully past the proximal contact point. The floss should be moved carefully up and down the proximal surface of each tooth, from just below the contact area to just below the gingival margin. Floss holders,

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which stretch the floss between two plastic supports, may be useful for patients with limited manual dexterity (Fig 2-5).

牙带是由单根纤维组成，其比普通牙线更宽更平，可减少磨损，不易扯断。牙带与牙线一样均可含有某些活性成分，如氯己定和氟化物。

Dental tape is essentially a thicker, flatter form of floss that comprises a single fibre that reduces the likelihood of fraying or shredding. Tape, like floss may be impregnated with active ingredients such as chlorhexidine and fluoride.

超级牙线

超级牙线专门用于清洁义齿桥体下的区域，其由三部分组成（图2-5c）：

- 一端涂蜡以方便其通过义齿桥体的下方。
- 中间海绵状部分用于清洁桥体的下方。
- 尾部即通常的牙线，用于清洁义齿固位体和天然牙之间的牙间隙。

Superfloss

Superfloss is specifically designed to clean beneath bridge pontics and comprises three parts (Fig 2-5c):

- one end is coated with wax to facilitate threading beneath the components of the bridge
- a spongy central section for cleaning beneath pontics
- a “tail” of conventional floss for use interdentally between retainers and natural teeth.

邻面刷（图 2-6）

邻面刷只有一束刷毛，尤其适于清洁以下部位：

- 靠近缺牙间隙的天然牙的邻面。
- 口腔中最后一颗牙的远中面。
- 下颌牙舌侧。

Interspace Brushes (Fig 2-6)

Interspace or single-tufted brushes have just one tuft of bristles. These are especially useful for cleaning:

- proximal surfaces of teeth when adjacent teeth are absent
- distal surfaces of the most posterior remaining tooth
- the lingual surfaces of mandibular teeth

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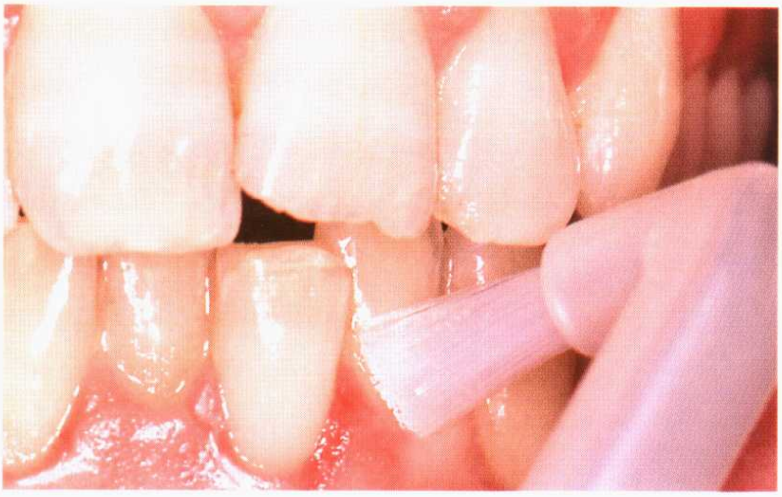


图2-6 邻面刷适用于清洁普通牙刷不易达到的地方，包括因龈退缩而暴露的根面和邻牙缺失后的牙的邻面

Fig 2-6 An interspace brush is useful for cleaning inaccessible areas including root surfaces affected by gingival recession and the interproximal surfaces of teeth when adjacent teeth are absent

- 正畸矫治器的周围。
- 牙龈退缩的牙体部分。
- 因牙列拥挤而普通牙刷难以刷到的牙。
- 牙冠表面或根面凹陷以及早期（Ⅰ度）根分叉病变。
- 种植体的外露部分。

- around orthodontic appliances
- areas of gingival recession
- areas of crowding with instanding teeth that are missed by a regular toothbrush
- tooth/root concavities and incipient (class I) furcation lesions
- exposed portions of implants.

牙间刷（图2-7）

牙间刷的刷毛外形为锥形或柱形，具有弯曲的金属刷柄。目前牙间刷有多种多样的形状和尺寸，可用于清洁：

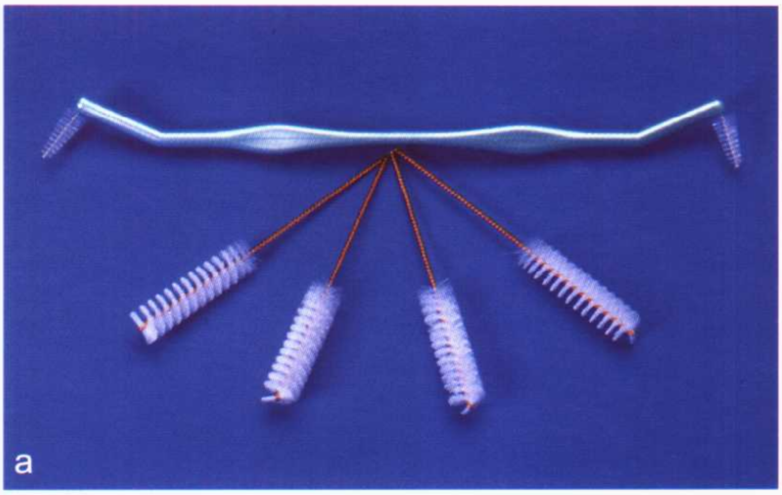
- 牙间隙，尤其当龈乳头萎缩而牙间隙根方有足够的空间时。
- 龈下。
- Ⅱ、Ⅲ度根分叉病变。
- 种植修复体周围（这种牙间刷的

Interdental Brushes (Fig 2-7)

Interdental brushes are conical or tube-like brushes ("bottle brushes") made of bristles mounted on a twisted metal wire handle. They are available in many different designs and sizes, and may be used to clean:

- interproximally, particularly in locations where there is loss of the interdental papilla and there is sufficient room for the brush
- subgingivally
- in class II and class III furcations
- around implant restorations (the wire

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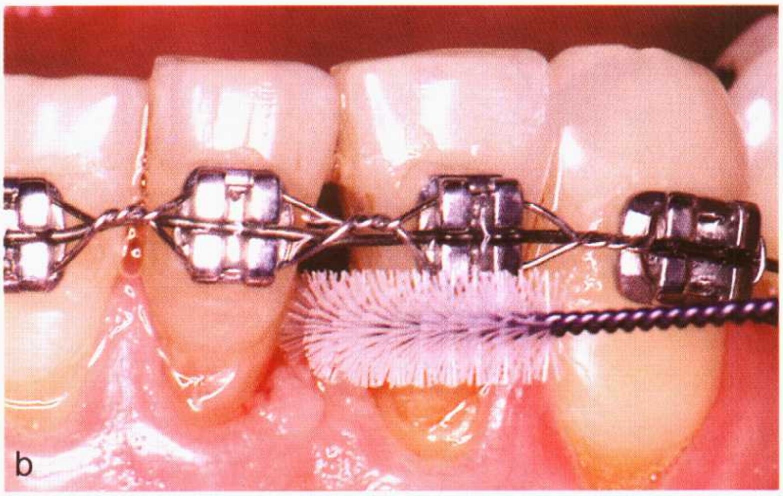


图2-7 a. 目前所用的各种牙间刷；b. 一把正在用于清洁装有固定矫治器的下切牙邻面的牙间刷

Fig 2-7 a. A range of interdental brushes that are available; b. An interdental brush being used to clean interproximally between mandibular incisors in a patient undergoing fixed appliance orthodontic therapy

刷柄应由塑料制成，以防种植体表面被刮伤）。

木质牙签（图2-8）

木质牙签截面为三角形，由软的桦木制成，用于清除前牙间隙中的菌斑和软垢。患者使用木质牙签时应非常小心，否则口腔组织会受到创伤，并有牙签折断的危险。儿童不适合用牙签。

handle being plastic-coated to prevent scratching of the implant surface).

Woodsticks (Fig 2-8)

Woodsticks are triangular in cross-section, made of soft birch wood, and are used to dislodge plaque and debris from accessible interdental sites in anterior teeth. There is a risk that the wood may splinter and there is a tendency for self-inflicted trauma unless patients have been instructed very carefully in their use. They are not suitable for use in young children.

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菌斑的化学控制（图 2-9）

漱口水及牙膏中含有化学药物能抑制菌斑和牙石的形成（表 2-2）。因此，这些抗菌制剂在临床上对牙龈炎可能有显著疗效。

Chemical Plaque Control (Fig 2-9)

Chemical agents have been incorporated into mouth rinses and toothpastes with the objective of inhibiting the formation of plaque and calculus (Table 2-2). Antiplaque agents may, therefore, have a significant clinical effect of resolving an established gingivitis.

阳离子活性剂

二糖苷氯己定

Cationic agents

Chlorhexidine digluconate



图 2-8 木牙签的正确使用方法：去除前牙间隙中的菌斑和软垢，木牙签的使用要很小心，而且应告诉患者牙签的底端必须对着龈组织

Fig 2-8 Correct use of a wood stick to dislodge plaque and debris from an interdental site between anterior teeth. Note that wood sticks have to be used with extreme care and patients must be reminded that the flat base of the stick must always be adjacent to the gingival tissues



图 2-9 几种市面上常见的漱口水，可用于化学菌斑控制，但许多患者仅用其来清除口腔异味

Fig 2-9 A small number of the vast range of commercially available mouth rinses that may be used for chemical plaque control. Many patients, however, use these products simply as a means of "freshening their breath"

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表 2-2　用作化学控制菌斑的某些漱口水

Table 2-2　Examples of commercially available mouth rinses that are designed for chemical plaque control

漱 口 液	主要活性成分	生 产 厂 家
Sensitive™	氯化十六烷基吡啶	Boots 公司
Complete Care™	氯化十六烷基吡啶	Macleans 公司
Oracle™	氯化十六烷基吡啶	Safeway 公司
Sensodyne™ Gentle	氯化十六烷基吡啶	GlaxoSmithKline 公司
Dentimint Total Care™	氯化十六烷基吡啶	McBride 公司
Aquafresh™	氯化十六烷基吡啶	GlaxoSmithKline 公司
Antiplaque™	氯化十六烷基吡啶	Oral B 公司
Coolmint/Freshmint	氯化十六烷基吡啶	Tesco 公司
Dentyl pH™	氯化十六烷基吡啶和三氯生	Fresh Breath 有限公司
Corsodyl™	0.2% 氯己定	GlaxoSmithKline 公司
Chlorohex™	0.2% 氯己定	高露洁公司
Listerine™	麝香草酚和氯化锌	Pfizer 公司
Plax™	三氯生，硫酸十二烷基钠及甲氧乙烯－顺丁烯酸共聚物	高露洁公司

氯己定(洗必泰)常用来作漱口水(0.2%或0.12%，重量/体积)，也可做成凝胶使用（图 1-5）。目前已将氯己定加入到口香糖、牙线、口腔喷雾剂、牙周缓释剂、牙周塞治剂等产品中。

Chlorhexidine is frequently used as a mouth rinse (0.2% or 0.12% w/v). The compound can also be applied as a gel (Fig 1-5), and has been incorporated into:

- chewing gum
- floss
- sprays
- slow-release devices for controlled release of chlorhexidine directly into pockets
- periodontal packs.

低浓度的氯己定有抑菌效果，高浓度的氯己定可杀菌。氯己定杀菌的

At low concentrations, chlorhexidine is bacteriostatic, but at high concentrations,

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原理在于它可通过静电力作用于细菌的细胞壁，因为氯己定带正电荷，而菌细胞壁中的磷酸盐和羧基带负电荷，两者互相粘附后氯己定破坏细菌胞壁的屏障通透功能，从而改变了细菌细胞膜的通透性。

it is bactericidal. The mode of action of chlorhexidine in killing bacteria is dependent upon the agent having access to cell walls. Electrostatic forces facilitate this, since chlorhexidine is positively charged, whilst the phosphate and carboxyl groups of bacterial cell walls carry negative charges. Binding causes disruption of the osmotic barrier and interference with membrane transport.

用氯己定漱口可使唾液中的细菌量减少50%～90%，第5天左右下降到最低点，达到95%，然后再缓慢上升，40天时仍保持在70%～80%之间。

Rinsing with chlorhexidine reduces the number of bacteria in saliva by between 50% and 90%. A maximum reduction of 95% occurs around five days, after which thc numbers increase gradually to maintain an overall reduction of 70-80% at 40 days.

缓释性是氯己定的一个重要特性，即它可停留在口腔组织中并能缓慢释放。10ml 0.2%的氯己定含漱1分钟后，约30%保留在口腔中。含漱15秒，有一半药物与受体分子相结合。

An important property of chlorhexidine is its substantivity, that is, the retention in the mouth and subsequent release from oral structures. After a one-minute oral rinse of 10ml of chlorhexidine 0.2%, approximately 30% of the drug is retained, and within 15 seconds of rinsing, half will have bonded to receptor molecules.

氯己定漱口水或口腔凝胶只能短期使用，一旦患者能用牙刷及牙间清洁工具有效清除菌斑时，就应停止使用。以下情况可以使用漱口水：

- 牙周手术后防止细菌感染，减轻疼痛和炎症。
- 作为牙周对症治疗的一种手段。

Chlorhexidine mouth rinses and gels should be used in the short-term until toothbrushing and use of interdental aids are able to remove plaque effectively. For example:

- after periodontal surgery in the reduction of postoperative infection, pain and inflammation
- in the management of periodontal

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problems as part of a palliative care programme

• 预防药物性牙龈增生。

• to help prevent drug-induced gingival overgrowth

• 坏死溃疡性牙龈炎或牙周炎患者用于预防继发感染。

• to help prevent secondary infection in the management of necrotising ulcerative gingivitis and periodontitis

• 戴有固定矫治器或上颌固定器的患者。

• for patients provided with fixed orthodontic appliances or intermaxillary fixation devices

• 减少牙龈溃疡时（如病毒感染或口腔扁平苔藓引起的剥脱性龈炎）继发的感染。

• to help reduce superinfection of gingival ulcerative conditions, e.g. viral infections and erosive lichen planus (desquamative gingivitis).

氯己定（洗必泰）的不良反应有：

The main unwanted effects of chlorhexidine are:

• 引起牙、牙石、修复体及舌着色（图 2-10）。
• 味觉异常。

• staining of the teeth, calculus, restorations and the tongue (Fig 2-10)
• taste disturbances.

因此，氯己定只能短期使用（如 2～3周）。牙膏成分中的阴离子活性剂会与氯己定发生反应，从而使其向牙面的释放量降低，所以不建议刷牙前后马上使用氯己定。若漱口前已刷了牙，则应漱尽牙膏后再用氯己定。

Chlorhexidine should, therefore, only used for short periods (two to three weeks). Toothpaste components called anionic surfactants interact with chlorhexidine activity and lower its effective delivery to the tooth surface. It is therefore, not recom-



图 2-10　前牙及牙石被氯己定染色

Fig 2-10　Characteristic chlorhexidine staining of anterior teeth and calculus

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mended that chlorhexidine be used before or immediately following toothbrushing. If toothpaste has been used before rinsing, paste should be rinsed away before using the chlorhexidine mouth rinse.

季铵盐

Quaternary ammonium compounds (QACs)

常见的季铵盐有氯化十六烷基吡啶（Cetylpyridinium chloride，CPC）（常与溴化度米芬合用）、苄索氯铵和氯化苯乙铵。这些物质带正电荷，可与细菌细胞壁带负电荷的磷酸基团起反应，使细胞壁破裂，导致细胞通透性增加，细胞内容物丧失。

Examples are cetylpyridinium chloride (CPC) (often combined with domiphen bromide), benzalconium chloride and benzethonium chloride. These substances have a net positive charge, which reacts with the negatively charged phosphate groups on bacterial cell walls. The walls are disrupted, resulting in increased permeability and loss of cell contents.

研究表明0.05%的CPC（或加有溴化度米芬）和苄索氯铵可使菌斑减少25%～35%，但对龈炎疗效不明显。市面上将0.1%的CPC作为刷牙前的漱口用药。

Studies suggest that CPC 0.05% (with or without domiphen bromide) and benzethonium chloride causes a reduction in plaque of between 25% and 35%, but with less obvious effects on gingival inflammation. CPC (0.1%) is also marketed as a pre-brushing rinse.

酚　类

Phenols

酚类具有非特异性抗菌作用，它是依靠药物本身特性以非离子的形式穿透细菌胞壁的脂质层。酚类物质可能也具有抗炎特性，因为它们能抑制中性粒细胞趋化，抑制中性粒细胞源性的超氧阴离子中和作用，抑制前列腺素合成酶的产生。

Phenols exert a non-specific antibacterial action, which is dependent upon the ability of the drug, in the non-ionized form, to penetrate the lipid components of bacterial cell walls. Phenolic compounds may also exhibit anti-inflammatory properties, which may result from their ability to in-

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hibit neu-trophil chemotaxis, the neutralisation of neutrophil-derived superoxide anions and the production of prostaglandin synthetase.

ListerineTM

ListerineTM漱口水是非处方抗菌药，其含有麝香草酚（0.06%），桉树油(0.09%)，甲基水杨酸盐(0.06%)，甲醇（0.04%）以及乙醇（16.9%）。用Listerine 20ml漱口，2/d，可使口腔菌斑及龈炎分数下降35%。

ListerineTM

ListerineTM is an over-the-counter antiplaque agent that contains thymol (0.06%), eucalyptol (0.09%), methyl salicylate (0.06%) and methanol (0.04%) in 16.9% alcohol. Twice daily rinsing with 20ml of ListerineTM as a supplement to normal oral hygiene produces a 35% reduction in plaque and gingivitis scores.

三氯生TM

三氯生TM是一种双酚类、非离子型的杀菌剂，其杀菌谱广泛，能杀灭革兰阳性到革兰阴性的细菌以及真菌。三氯生吸附到细菌细胞膜上的脂质部分，阻止细菌脂类的合成。低浓度的三氯生可干扰细菌的转运机制。0.1%～0.2%浓度时副作用最小，为最适的有效浓度。当三氯生与枸橼酸锌复合或与甲氧乙烯－顺丁烯酸组成共聚物时活性加强。共聚物增强三氯生TM的缓释性，并可作为贮藏液。

TriclosanTM

TriclosanTM is a bisphenol, non-ionic germicide with a broad spectrum of activity against gram-positive and gram-negative bacteria and fungi. The compound adsorbs on to the lipid portion of the bacterial cell membrane and blocks lipid synthesis. At low concentrations, Triclosan interferes with vital transport mechanisms in bacteria. A concentration of between 0.1% and 0.2% is suitably efficacious with minimal side effects. Activity is enhanced when the compound is combined with zinc citrate or incorporated into a copolymer of methoxyethylene and maleic acid. The copoly-mer increases the substantivity of TriclosanTM and acts as a reservoir.

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Plax™

Plax™漱口水是一种复合型阴阳离子表面活性剂，其含有硫酸十二烷基钠和聚山梨醇酯20。市售的Plax™漱口水还含有0.3%的三氯生或甲氧乙烯－顺丁烯酸共聚物，它可以作为一种抗菌产品使用。

Plax™

Plax™ rinse is a combination of anionic and ionic surfactants including sodium lauryl sulphate and polysorbate 20. Triclosan 0.3% and a methoxyethylene and maleic acid copolymer have been added to the rinse that is now marketed as an anti-plaque product.

血根碱

血根碱具有芳香性生物碱结构，它由血根植物血根草经乙醇提取。血根碱具有抗菌性，是因为它能抑制细菌细胞内酶的活性——很可能是通过氧化硫醇基团导致酶失活。该提取物现已加入漱口液和牙膏中使用，最常用的浓度为0.03%。与氯己定相比，血根碱抗菌效力相对较低，但其最大优点为无明显的不良反应，虽然曾有报道使用血根碱时口腔有轻到中度的灼热感且有黏膜轻度脱皮。

Sanguinarine

Sanguinarine is a benzophenathridine alkaloid structure obtained by alcoholic extraction from the bloodroot plant Sanguinaria candensis. Antibacterial properties of sanguinarine are thought to be due to its ability to suppress the activity of intracellular bacterial enzymes, possibly through oxidation of thiol groups. The extract has been incorporated into a mouth rinse and toothpaste, and 0.03% is the most frequently evaluated concentration. The anti-plaque efficacy is low when compared to that of chlorhexidine. Thc main advantage of sanguinarine over chlorhexidine is the relative absence of unwanted effects. A mild to moderate burning sensation in the mouth and mild sloughing of the oral mucosa have been reported.

重金属盐

据报道，锌、锡、铜盐也可抑制牙菌斑生长，阻止牙石的形成。

Heavy metal salts

Salts of zinc, tin and copper are reported to inhibit the growth of dental plaque and impede calculus formation.

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锌　盐

与氯己定相比，锌盐抗菌活性较低。枸橼酸锌和氯化锌常加入牙膏，锌盐显示有良好的缓释性，用含0.5%的枸橼酸锌牙膏刷牙后约30%的锌可停留在口腔中，当枸橼酸锌和三氯生™合用时二者的活性均有所提高。

Zinc salts

Zinc salts possess antiplaque activity although generally it is lower than that of chlorhexidine. Zinc citrate and chloride are frequently incorporated into toothpaste. Zinc salts exhibit good substantivity, with 30% of zinc retained in the mouth after toothbrushing with a 0.5% zinc citrate toothpaste. The activity of both zinc citrate and Triclosan is enhanced when the products are used in combination.

锡　盐

锡离子的抗菌机制在于它们能与革兰阳性菌表面的脂磷壁酸结合，导致细菌表面电荷逆转，从而使其吸附到牙表面的能力下降。细菌内锡盐的堆积可以改变其本身的代谢以及其他生化特性。锡盐可造成牙面与舌面着色，但易被清除。

Tin salts

The suggested antibacterial mechanisms of tin ions are thought to be mediated through their ability to bind to lipotechoic acid present on the surfaces of gram-positive bacteria. The net surface charge of the organism is therefore reversed and the adsorption of the bacteria on tooth surfaces is reduced. The accumulation of tin in bacteria may alter their metabolism and other physicochemical characteristics. Stannous salts cause staining of the teeth and the tongue, although the stain is easily removed using prophylaxis paste.

酶

有关酶的使用研究如今已停滞了，目前所使用的系统为乳过氧化物酶－亚硫氰酸盐系统。

Enzymes

Research into the use of enzymes as antiplaque agents has been largely discontinued. One enzyme system that is currently available is the lactoperox-idase-

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hypothiocyanite system.

乳过氧化物酶——亚硫氰酸盐

口腔内某些细菌可通过$NADH_2$氧化酶将糖分解酶$NADH_2$氧化并产生过氧化氢（H_2O_2）。此过氧化氢可将另一分子的$NADH_2$氧化，或被过氧化氢酶失活。当唾液中的H_2O_2的水平升高时，H_2O_2可辅助乳过氧化物酶氧化硫氰酸盐（SCN^-），从而产生亚硫氰酸盐离子（$OSCN^-$）。后者可通过干扰$NADH_2$–$NADPH_2$平衡体系，影响细胞的氧化还原反应。通过利用更深层次酶系统（涉及到葡萄糖苷淀粉酶和葡萄糖氧化酶）的原理，英国Oral B公司生产出Zendium™牙膏，其中除含有葡萄糖苷淀粉酶（1.2%，w/w）和葡萄糖氧化酶（1.0%，w/w）外，还含有硫氰酸钾（0.2%，w/w）和氟化钠（0.26%）。

Lactoperoxidase-hypothiocyanite

Certain oral bacteria are known to produce hydrogen peroxide (H_2O_2) by the oxidation of the glycolytic enzyme $NADH_2$ by $NADH_2$ oxidase. This H_2O_2 either oxidizes another $NADH_2$ molecule or is inactivated by the enzyme catalase. When the level of H_2O_2 in saliva is increased, it assists lactoperoxidase in the oxidation of thiocyanate (SCN^-) to produce the hypoth-iocyanite ion ($OSCN^-$). The latter interferes with the redox mechanisms of cells by upsetting the $NADH_2$- $NADPH_2$ balance. The production is achieved by introducing a further enzyme system involving amyloglucosi-dase and glucose oxidase. This system is the basis for the production of the commercially available toothpaste Zendium™ (Oral B, UK). In addition to amyloglycosidase (1.2% w/w) and glucose oxidase (1.0% w/w), Zendium contains potassium thiocyanite (0.2% w/w) and sodium fluoride (0.26%).

临床要点

- 完全去尽菌斑是不现实的，菌斑控制应因人而异。
- 对于任何人，能够达到的菌斑控制水平应与口腔健康水平一致，

Key Points of Clinical Importance

- Complete removal of plaque is an unrealistic aim and plaque control programmes should be tailored to the individual needs of patients.
- For any individual, the level of plaque control achieved should be consistent

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也就是说不同的病人，消除炎症时所要求达到的菌斑控制水平是不相同的。

with oral health. That is, the threshold level required to resolve inflammation varies from patient to patient.

- 非手术治疗之口腔卫生宣教阶段包括：牙刷的选用、刷牙方法、牙邻面清洁工具的使用。

- The hygiene phase of non-surgical treatment involves instruction in the use of toothbrushes, a toothbrushing technique and the use of interdental cleaning aids.

- 研究表明电动牙刷可能会比传统牙刷更有效，但这部分可能是由于患者运用某种产品的新鲜感所造成。

- Studies have shown that powered toothbrushes may be marginally more efficient than conventional toothbrushes but this may, in part, be a result of the novelty effect of using a new product.

- 市面上有多种多样的牙邻面清洁工具，但这些须根据患者需要选用。

- There is a wide range of interdental aids available on the market and these should also be carefully tailored to the individual needs of patients.

- 化学试剂控制菌斑产品如漱口水也有很多，无论如何，这些产品应短期使用，当患者掌握控制菌斑的机械方法时，就应停止使用。

- There is a wide range of mouth rinses available for chemical control of plaque. Such products should, whenever possible, be for short-term use until a patient is able to reintroduce or master adequate mechanical plaque control.

- 若患者已能进行良好的菌斑控制，则不推荐用漱口水。

- There are few reasons to recommend mouth rinses for patients who perform adequate plaque control.

- 研究显示氯己定为最有效的菌斑控制剂，但不宜在刷牙前后1h内使用。

- Research suggests that chlorhexidine is the most effective agent for chemical plaque control, but it should not be used within an hour of toothbrushing.

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拓展阅读

Further Reading

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2 Heasman PA, McCracken GI. Clinical evidence for the safety and efficacy of powered toothbrushes. Adv Dent Res 2002;16:1-7.

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第3章 牙周器械及其使用

Instruments and Instrumentation

目 的

本章的目的是描述牙周病非手术治疗时所使用的各种器械。

Aim

The aim of this chapter is to describe a range of instruments used for the non-surgical management of periodontal disease.

要 点

阅读完本章，读者应能辨认出各种器械并了解每一种牙周器械的使用目的以及器械在不同条件下使用时的优缺点。

Outcome

After reading this chapter the reader should be able to identify the various types of instruments and have an understanding of the purpose of each periodontal instrument, and its advantages and disadvantages in different situations.

简 介

牙周非手术治疗使用的器械大体分为两种：手用和机用（如声波洁治器，超声洁治器，气磨系统）。

Introduction

The instruments used for periodontal non-surgical management can be divided into of two main categories:

- hand instruments
- powered instruments (sonic scalers, ultrasonic scalers and air-abrasive devices).

手用器械

刮治术可用到多种器械，每种器

Hand Instruments

There are many groups of instruments

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械只在口腔中的某一特定区域内使用。器械可通过以下方式进行分类：

- 龈上／下器械
- 通用或区域／牙特异性器械

洁治器械通常分为凿形洁治器、三面形洁治器、锄形洁治器、牙用锉以及刮治器。

that are used for scaling procedures. Each instrument is designed for use in a specific area of the mouth. An instrument can be categorised by:

- whether it is to be used for supragingival or subgingival instrumentation
- whether it is a universal or area/tooth specific instrument.

Scaling instruments fall into the general categories of:

- chisels
- trihedral scalers
- hoes
- files
- curettes.

凿形洁治器或推形洁治器(Guy's G1 或 G2, Cushings 或 Watch-Spring)

凿形洁治器较平直，仅在刃部向颈部过度时发生少许弯曲(图3-1)，刃末端平，直的切缘与水平面成45° 角。凿形洁治器有不同的宽度，使用时从下前牙唇侧进入，通过上下推拉刮治去除邻面和舌侧的龈上牙石。当牙龈(或牙周袋)与牙根之间的空隙足够大时才能使用凿形洁治器，否则将导致牙龈创伤。

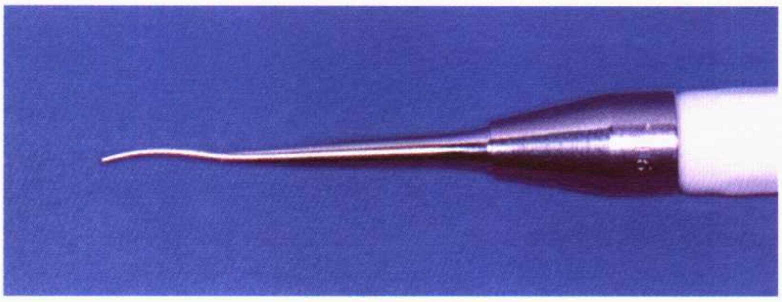
Chisel Scaler or Push Scaler (Guy's G1 or G2, Cushings or Watch-Spring)

The chisel scaler is a straight instrument that curves slightly as the blade extends from the shank (Fig 3-1). The end of the blade is flat, with a straight cutting edge that is bevelled at 45°. It is available in different widths and is used with a controlled push stroke from the labial aspect of the lower anterior teeth to remove interproximal and lingual supragingival calculus. It should only be used where there is sufficient embrasure space or gingival trauma will result. It may be used subgingivally where the interdental papillae have lost attachment. A mouth mirror should always

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图3-1　凿形洁治器较平直，仅在刃部从颈部刚伸出处有些弯曲

Fig 3-1　The chisel scaler is a straight instrument that curves slightly as the blade extends from the shank



be used to protect the tongue and the floor of the mouth.

三面形洁治器(H6，H7，G3，G4，J1 和 H5)

三面形洁治器工作端横截面为三角形（图3-2），有双侧刃边，低位刃边设计可以防止损伤龈组织，高位刃的表面顶端止于一点。刃部的侧面弯曲，这使其更容易与牙面贴合，而颈部呈直线或呈反角状。三面形洁治器有两种：镰形器和jacquette洁治器（G3，G4，J1 和H5）。镰形器（H6 和H7）主要用于清除龈上结石或清除表浅的龈下结石，小镰形洁治器用于下前牙，工作端的弯曲度更大，效率更高（图 3-3）。

Trihedral Scalers (H6, H7, G3, G4, Jl and H5)

The working end of trihedral scalers is triangular in cross-section (Fig 3-2). It is designed so that its lower border does not damage gingival tissue. There are two blades, one either side of the superior surface, which end in a point. The blades curve in a lateral plane allowing them to engage the tooth surface. The shank may be straight or contra-angled. There are two main types of trihedral scalers: sickle scalers and jacquette scalers (G3, G4, Jl and H5). Sickle scalers (H6 and H7) are principally used for the removal of supragingival calculus or for subgingival calculus that is located just below the gingival margin. For lower anterior teeth a minisickle scaler has a tighter curve at the instrument's working end that contours more efficiently (Fig 3-3).

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图3-2 三面形洁治器工作端横截面成三角形

Fig 3-2 The working end of trihedral scaler is triangular in cross section

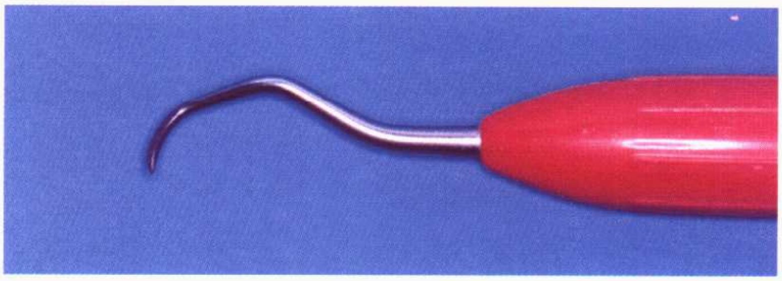


图 3-3 用于下前牙的小镰形器，工作端弯曲度更大

Fig 3-3 For lower anterior teeth a mini-sickle scaler has a tighter curve at the instruments working end

锄形洁治器

锄形洁治器（图3-4）的颈部有多种角度，末端稍扁。单侧刃，且有一定斜度。锄形洁治器适用于所有牙面，主要用于龈下刮治和根面平整。沿牙长轴平行上下推拉锄形洁治器，施力时要保持有两点与牙接触（图 3-5），使用时应十分小心，避免刃角将牙骨质刮去。这种器械打磨较困难，尽管含钨碳的锄形洁治器很耐用，不需要经常打磨。锄形洁治器分为四种，分别用于近中、远中、颊侧、舌侧（TC210，211，212和213）。表3-1列举了锄形洁治器的优缺点。

Periodontal Hoes

Periodontal hoes (Fig 3-4) have variously angled shanks with a functional “lip” at the end. The single blade is bevelled. Hoes can be used on all tooth surfaces and are primarily used for subgingival scaling and root surface instrumentation. Periodontal hoes are used with a “pull action” parallel to the long axis of the tooth. It is important that a two-point contact is maintained (Fig 3-5) throughout the instrument stroke. Care must be taken to avoid gouging of the cementum with the corners of the blade. These instruments are difficult to sharpen, although tungsten carbide hoes are durable and require less frequent sharpening. There are four instruments, which are designed to enable the mesial, distal, buccal and lingual surfaces to be instrumented (TC 210, 211, 212, and 213). Table 3-1 shows the advantages and disadvantages of periodon-

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表 3-1 锄形洁治器的优缺点

Table 3-1 Advantages and disadvantages of periodontal hoes

优　点	缺　点
锄形洁治器有四种，器械选取方便	只有一个点与根面接触（效率低）
其颈部刚度高，易于将坚硬的牙石清除	对窄袋来说，器械太宽
适合用于宽大的牙周袋	与根面外形不协调
	边角锐，易损伤软硬组织
	刃口含钨碳，需要特殊工具琢磨
	刃与颈部成 90° 角，不适合用于后牙
	难以在操作位点附近找到支点



图3-4 用于根面平整的锄形洁治器

Fig 3-4 Periodontal hoe used for root surface instrumentation

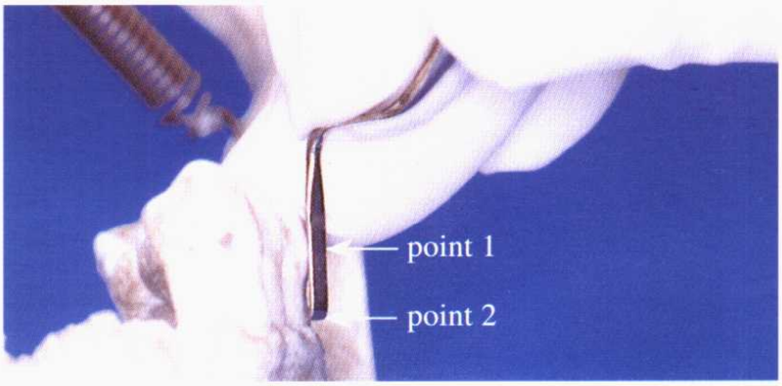


图3-5 使用锄形洁治器施力时要保持有两点与牙接触

Fig 3-5 When using a periodontal hoe a two-point contact must be maintained

tal hoes.

牙周锉（Hirschfeld 3/7，5/11和9/10）

牙周锉（图 3-6）工作端有多个直的刃边，它主要在以下这两种情况下使用：（1）清除某些已经磨光的牙石经

Periodontal Files (Hirschfeld 3/7, 5/11 and 9/10)

A periodontal file (Fig 3-6) is an instrument that has multiple, straight cutting edges at the working end of the instrument.

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图3-6 牙周锉工作端有多个直的刃边

Fig 3-6 A periodontal file has multiple straight cutting edges

声波或超声波器械洁治后，牙石变得光滑。再使用刮治器械刮治时，刃边容易打滑。此时牙周锉可以使光滑的牙石变得粗糙，以便其能被另一种器械刮除。(2)碾碎牙石，使其容易被刮治器清除。每种牙周锉只能用于单个牙面，因此可分为近中、远中、舌侧和腭侧牙周锉。金刚砂锉可使根分叉区的操作变得容易得多。

There are two main indications for using the periodontal file to facilitate calculus removal. The first is for the removal of burnished calculus deposits that have previously been "over instrumented" and have become smooth. Burnished calculus commonly results from sonic/ultrasonic instrumentation and is difficult to remove because the cutting edge of the instrument tends to slide over the smooth surface. A file is used to roughen the surface of the burnished deposit so that it can then be removed by another instrument. The second indication is for "crushing" calculus making it easier to remove with a curette. Each file is designed for use on a single tooth surface: mesial, distal, lingual and palatal. Diamond tipped files make furcation instrumentation much easier.

刮治器

刮治器分为两种：

- 通用刮治器
- 区特异性刮治器

Curettes

There are two main categories of curette:

- universal
- area-specific.

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通用刮治器（Columbia 2R/2L；Columbia 13/14；Langers 1/2；Langers 5/6）

通用刮治器（图3-7）刃背和尖均呈圆形，其工作端的两侧刃边相互平行，通常情况下通用刮治器成对生产，每把刮治器都有两个工作头，可用于口腔中所有牙的各个面。通用刮治器有多种不同的形状，因此在口腔中某一特定区选用它时，操作者要考虑刮治器工作端及功能颈部的形状特点。通用刮治器可用于刮除全口龈上和龈下牙石。虽然其刃边只有几毫米长，但刮治器可通过刃部末端 2～3mm 与牙表面接触以保证刮治器与牙面贴合。

Universal Curettes (Columbia 2R/2L; Columbia 13/14; Langers 1/2; Langers 5/6, and Langers)

A universal curette (Fig 3-7) is an instrument with a rounded back and rounded toe. Universal curettes have two parallel cutting edges at the working end. Usually curettes are paired as a double-ended instrument and can be applied to all tooth surfaces in both the anterior and posterior parts of the mouth. There are numerous designs of universal curette. In selecting a universal curette for a particular task, the operator should consider the design characteristics of the working end and functional shank. The universal curette is used throughout the entire mouth for the removal of both supragingival and subgingival calculus. Although the cutting edges are several millimetres long, adaptation of the universal curette to the tooth surface is achieved by placing the distal 2 to 3mm of the blade in the appropriate working relationship next to the tooth surface.

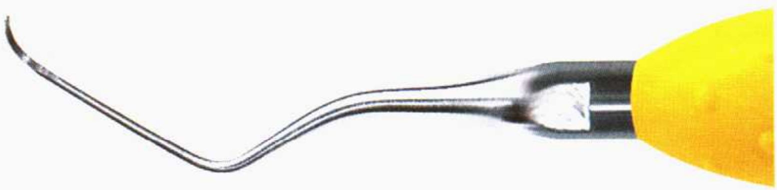


图 3-7　用于龈下的通用刮治器
Fig 3-7　A universal curette is used for subgingival instrumentation

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区特异性／位点特异性刮治器

区特异性／位点特异性刮治器是设计用于口腔中某一特定解剖区域的刮治器，最常用的为Clayton Gracey博士于20世纪30年代发明的Gracey刮治器（图3-8）。"区特异性"意思是指每一把刮治器只能用于某一牙面，因此刮整个牙列则需有一整套的刮治器。区特异性刮治器旨在为具有深牙周袋（牙周袋深度＞5mm，故其被称为"Gracey after-five"刮治器）及附着丧失的根面提供根面平整的通路，且不造成袋内上皮的损伤。Gracey刮治器特点为具有独特的刃部和长的弯曲的颈部。一些刮治器设计成各种弯曲，在对外形复杂牙根进行刮治时，操作变得相当容易（图3-9）。

Area-specific curettes/site specific curettes

Area- or site-specific curettes are designed for use in particular anatomical areas of the mouth. The most commonly used specific curettes are Gracey curettes (Fig 3-8) that were designed by Dr Clayton Gracey in the 1930s. The name "area-specific" signifies that each curette can be applied only tocertain surfaces, and for this reason, a complete set of curettes is needed to instrument the entire dentition. Area-specific curettes were intended to provide access for scaling and root surface instrumentation on root surfaces with deep pockets (>5mm, hence the term "Gracey after-five" curettes is used) and attachment loss without causing trauma to the pocket epithelium. Gracey curettes are characterised by their unique blade features and long flexible shanks. Some instruments are designed with complex bends that dramatically improve operator access to complex root morphology (Fig 3-9).

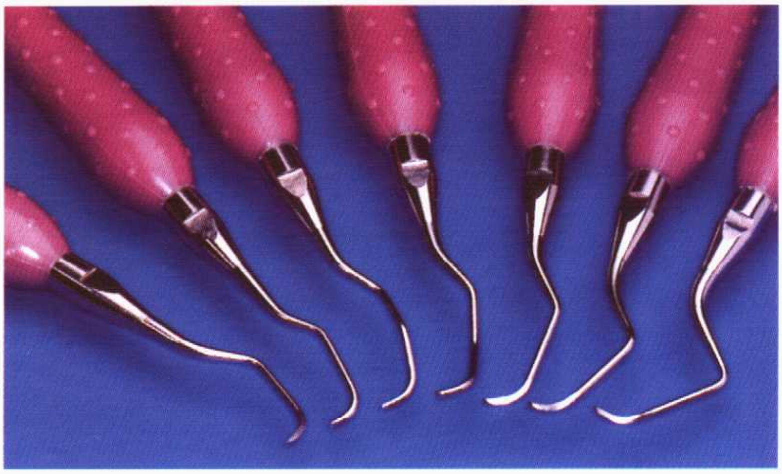
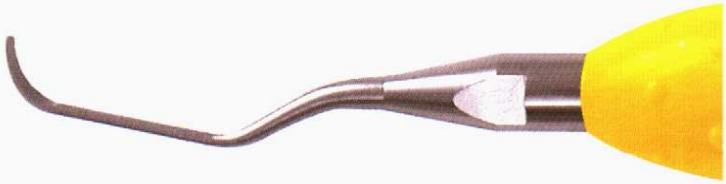


图3-8 具有面特异性的Gracey刮治器

Fig3-8 Gracey curettes, area-specific instruments

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图 3-9　Gracey 刮治器工作端有一定弯曲度
Fig 3-9　Gracey curettes have an angled working end



最初 Gracey 系列包含 14 把器械，虽然在临床上很少全部用到。刮治器有单头或双头两种，双头器械的两端刃部为镜面对称。一套标准的 Gracey 器械包括如下型号（图 3-8）：

- Gracey 1–2：用于前牙的所有牙面。
- Gracey 7–8：用于前磨牙和磨牙的颊舌面。
- Gracey 13–14：用于前磨牙和磨牙的远中面。
- Gracey 15–16（或 11–12）：用于前磨牙和磨牙的近中面。
- Gracey 17–18：用于一般器械进入困难的、磨牙的远中面。

Gracey 刮治器工作端的设计与通用刮治器或镰形刮治器不一样，其刃面与颈部末端呈 70° 角，刃边只有一侧为工作刃，另一侧为非工作刃，从而避免器械使用时损伤软组织。从横截面看，工作刃位于器械的下缘。

The original Gracey Series contains fourteen curettes although rarely are all fourteen curettes used in practice. The curettes are available as single-ended or double-ended versions, the double-ended instruments having “mirror image” blades. A standard set that may be used to access all tooth surfaces (Fig 3-8) would include:

- Gracey 1-2 — for all surfaces of anterior teeth
- Gracey 7-8 — for facial and lingual surfaces of molars and premolars
- Gracey 13-14 — for distal surfaces of molars and premolars
- Gracey 15-16 — for mesial surfaces of molars and premolars (or 11-12)
- Gracey 17-18 — for distal surfaces of molar teeth of difficult access.

The working end of the Gracey curette is designed differently from that of the universal curette or sickle sealers. The face of the blade is machined onto the Gracey instrument at a 70° angle to the lower or terminal shank. The opposite cutting edge is machined off in the manufacturing process

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工作刃可通过观察刃面与颈部的交角而辨认出来，此时应选择低位刃作为工作刃。比较刃部两侧曲度也可确定长的或凸的刃边为工作刃。刃部设计原理有助于辨认所有Gracey 系列刮治器的工作刃。被称为"minifive"的Gracey 刮治器用于窄的牙周袋，其号码与"after five"系列一样。表3-2显示了通用刮治器与Gracey 刮治器的差别。

leaving one cutting edge on each end of the instrument to avoid soft tissue trauma during use. Viewed in cross section, the cutting blade is the lower edge of the instrument.

The cutting edge can be readily identified by visually comparing the angle of the face of the blade to the lower shank and therefore selecting the correct "lower cutting edge". Furthermore, if the face of the blade is examined to compare the curvature of the two sides of the working end, then the "longer" or "convex" curved blade is selected. The application of the principles of blade design allows the identification of the cutting edge of any of the Gracey Series curettes. A set of Gracey curettes called "mini five" curettes has been designed to enable access to narrow pockets; their numbering is the same as for the "after five" series. Table 3-2 demonstrates the differences between Universal and Gracey

表3-2 通用刮治器与Gracey 刮治器的区别

Table 3-2 Universal versus Gracey curettes

通用刮治器	Gracey 刮治器
适用于所有区域及牙面	具有牙与牙面特异性
刃面与颈部呈90°角	刃面与颈部呈70°角
双侧工作刃	只有一侧工作刃
只有一个方向弯曲	有两个方向的弯曲
颈部短	颈部长且弯
颈部柔韧，但不如Gracey 刮治器	柔韧性强的颈部可减少手指疲劳和根面损伤

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curettes.

根面器械处理的操作规程

- 重新检测探诊深度/出血情况/牙石情况。
- 局部麻醉。
- 0.2%氯己定漱口可使气雾中细菌污染减少 90%。
- 用 WHO 牙周探针或类似牙周探针工具（如 OLD Dominican 大学（ODU）的牙周探针）探查根面。
- 使用超声龈下洁治器。
- 用 WHO/ODU 探针重新探查。
- 使用手用器械进行细刮（如 Gracey 刮治器）。
- 必要时可反复探诊检查。
- 结束时用超声器械荡洗牙周袋。

Recommended Protocol for Root Surface Instrumentation (RSI)

- Re-check probing depths/bleeding/deposits.
- Apply local anaesthesia.
- Chlorhexidine rinse (0.2%) will reduce microbial contamination in aerosol by 90%.
- Explore root surface thoroughly with World Health Organization (WHO) probe or similar (e.g. "Old Dominican University" (ODU) explorer - see below).
- Use ultrasonic sealer (see protocol below).
- Re-explore with WHO/ODU explorer.
- Use hand instruments for fine tactile work (e.g. Gracey curettes).
- Re-check with explorer and repeat as necessary.
- Finish with ultrasonic instrument to irrigate the pockets.

机用洁治系统

机用洁治系统是将电能转换成机械能，以去除牙面龈上或龈下的牙石以及牙周袋内的菌斑。超声洁治系统最早于1955年开始使用，如今其已被广泛应用于牙周治疗。现在机用洁治系统主要有超声波和声波两个系统，二者均利用高频振动原理，并配备有

Mechanised Instruments

Mechanised sealers are power-driven units that convert electrical energy to mechanical energy to remove supragingival and subgingival calculus deposits from the teeth and bacterial plaque from periodontal pockets. Ultrasonic instruments were introduced for scaling in 1955 and are now

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水冷系统。

commonly used for periodontal treatment. The two categories of mechanised instruments are ultrasonic units and sonic handpieces; both vibrate at a high frequency using a water-cooled system.

超声系统

超声系统包括发电机、手机和工作尖。这个系统能将电流转变成机械能，从而使工作尖高频率振动。超声装置工作频率超过人可听到的频率，达到18～50kHz。现在超声系统有两种：

- 磁伸缩式，如登士柏的Cavitron™（图3-10）。
- 压电式，如MS Unit（图3-11）。

Ultrasonic Units

Ultrasonic units comprise an electric generator, a handpiece, and interchangeable instrument tips. These units work by converting electrical current to mechanical energy in the form of high-frequency vibrations of the instrument tip. Ultrasonic devices operate at frequencies above the audible range; 18,000 to 50,000 cycles per second (18 to 50 kHz) range. There are two types of ultrasonic units:

- magnetostrictive, e.g. Dentsply Cavitron™ (Fig 3-10)
- piezoelectric, e.g. MS Unit (Fig 3-11).

磁伸缩式系统

磁伸缩式超声系统（图3-10a）安装在一个包含发电机、水流控制系统的便携装置内。水冷系统可直接与水流主供设备或单独的便携设备（这个设备可用来装抗菌药物以冲洗牙周袋）连接。然而一些研究表明用氯己定超声荡洗牙周袋并无显著疗效，这是因为氯己定在袋内的作用时间太短，因而无法在局部保持有效浓度。大多数磁伸缩式系统采用可拆卸的插拔式工作尖，并能与手机匹配。发电机产生低

Magnetostrictive Units

Magnetostrictive ultrasonic units (Fig 3-10a) are housed in portable units that contain an electric generator and a water control system. The water-cooling system can be connected to the main water supply or a separate portable unit, which can be used to deliver antibacterial medicaments into the periodontal pocket. However, several studies have demonstrated no significant improvement in clinical outcomes, when chlorhexidine is used as an irrigant over

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图 3-10　a. 登士柏公司的磁伸缩超声洁治器；b. 用于去除大块牙石的宽大的工作尖；c. 用于清除中等程度的龈上下牙石的通用工作尖；d. 可深入深袋及根分叉区的细工作尖

Fig 3-10　a. Magnetostrictive (Cavitron) scaler manufactured by Dentsply; b. beavertail tip used for removal of heavy calculus deposits; c. universal tip used for moderate supra- and subgingival calculus deposits; d. precision(slimline) tip used to provide best access to deep pockets and furcation areas

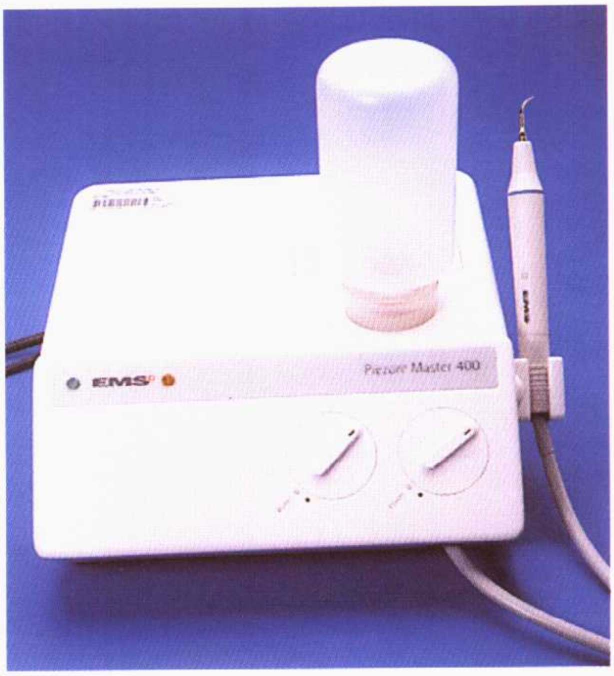


图 3-11　MS 公司的压电式超声系统

Fig 3-11　Piezoelectric unit manufactured by MS

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压电流，使手机内部产生磁场从而使工作尖延自身长轴伸缩，高频率的伸缩导致工作尖振动。工作尖振动轨迹为椭圆形，此意味着当其与根面接触时，工作尖的所有面均在振动。

water irrigation, because chlorhexidine does not remain within the pocket for long enough to be effective. Most units use removable instrument inserts that fit into the handpiece. The electric generator produces a low-voltage electric current in the handpiece. This current produces a magnetic field in the handpiece that causes the insert to expand and contract along its length and, in turn, causes the insert to vibrate. The pattern of vibration of the tip is elliptical, which means that all sides of the tip are active when adapted to the tooth surface.

磁伸缩式系统的工作尖

现代超声洁治系统的工作尖有宽大型、精密尖细型等多种型号。每个公司所生产的工作尖只能与他们自己的超声系统相匹配。不同的公司设计的工作尖不同，因此一个公司所设计的工作尖不能和另外一个公司的超声系统相匹配。与手用器械一样，病情不同，所使用的超声工作尖也不同。宽大的工作尖（bevertail）用于去除大块的龈上牙石，尤其是前牙的舌侧牙石（图3-10b）。中等大小的工作尖（通用型或镰形，图3-10c）用于清除中等程度的龈上牙石；如果这种工作尖容易进入龈下，则可用于龈下刮治；通用型的工作尖可用于前后牙。细尖（图3-10d）易于进入深袋和根分叉区，故其用于清除龈下牙石（该尖的直径与牙周探

Inserts for magnetostrictive units

Modern ultrasonic instrument inserts range in size from large, broad tips to precision thin inserts. Each manufacturing company produces unique instrument inserts for their ultrasonic units. The variety of insert designs varies from company to company, and one manufacturer's tips will not necessarily fit another company's ultrasonic unit. Ultrasonic inserts should be selected in a similar manner to hand instruments. Large, broad working ends (beaver-tail) are designed to remove heavy supragingival calculus deposits, especially from the lingual aspects of anterior teeth (Fig 3-10b). Medium-sized working ends (universal or sickle: Fig 3-10c) are used to remove moderate supragingival calculus

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针相等)。

deposits and may be used subgingivally if tissue distension allows for easy insertion of the tip. With this universal application the tips can therefore be used for both anterior and posterior teeth. Precision thin (or slimline) tips (Fig 3-10d) provide the best access to deep pockets and furcation areas and are used to remove subgingival deposits (precision thin ultrasonic tips are similar in diameter to periodontal probes).

压电式超声系统

压电式超声系统(图 3-11)为一便携式装置，也由发电机、水流控制系统组成。该装置的供水系统为贮水器，也可通过进水管直接与外界供水设备相连。若供水系统为贮水器，则可加入抗菌药物，对牙周袋进行药物冲洗。压电式超声系统工作尖的振动方向为前后向，能使尖两侧的物体共振。

Piezoelectric Ultrasonic Units

The piezoelectric ultrasonic (Fig 3-11) device is housed in a portable unit that contains an electric generator and a water control system. The unit may have either a fluid reservoir or tubing used to connect the unit to an external water supply. If a fluid reservoir is available this can be used to irrigate periodontal pockets with an antibacterial medicament. In piezoelectric units the pattern of the vibration of the tip is back and forth, with the two sides of the tip being active.

压电式超声系统的工作尖

用一种特殊工具可将压电式超声系统的工作尖直接旋入手机。发电机在手机内产生高压交流电；电压产生电场，使压力晶体延着自身长轴伸缩运动，从而使工作尖振动。压电式超声系统有多种工作尖(图 3-12)：A 尖用于去除龈上、下牙石；B 尖用于去除舌

Inserts for piezoelectric units

Instrument tips screw directly into the handpiece with the aid of a special tool. The electric generator produces an alternating, high voltage in the hand-piece. The voltage produces an electric field in the handpiece that causes the piezo crystals to expand and contract along their diameter,

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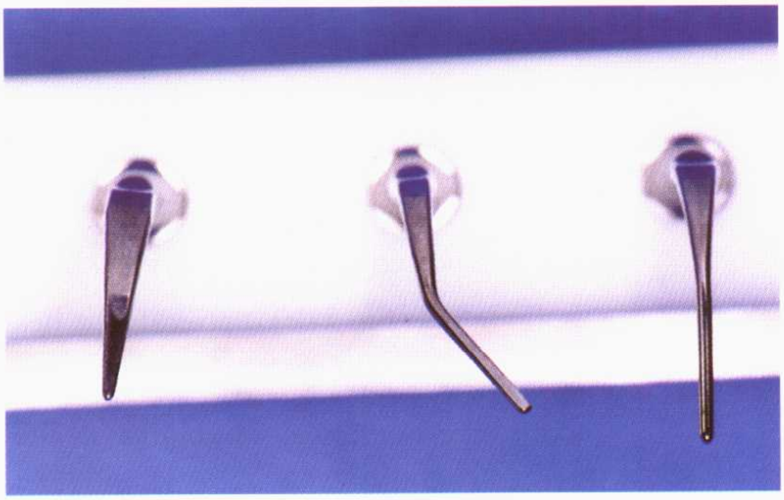


图3-12 压电式超声系统的工作尖(从左到右：A尖，B尖和P尖)
Fig 3-12 Piezoelectric tips (from left to right: tipA, tip B, tip P)

侧牙石；P尖用于去除龈下牙石或冲洗牙周袋；PS尖用于根面平整。

which causes the instrument tip to vibrate. There are a variety of tips available for piezoelectric units (Fig 3-12). Tip A is recommended for supra- and subgingival calculus, tip B is used for deposits on the lingual surface, tip P irrigates subgingival pockets and removes subgingival calculus and tip PS is used for root surface instrumentation.

声波手机

声波手机包括气动手机和可更换的工作尖。声波手机（图3-13）利用空气压力产生机械振动直至使工作尖运动。声波手机的工作尖振动频率为3～8kHz。声波器械清除牙石的能力低于超声器械，因为前者振动频率低，使得工作尖每秒钟撞击牙石的次数减少。但有研究表明：对于慢性牙周炎，声波和超声波器械治疗的临床疗效相同。

Sonic Handpieces

Sonic handpieces are mechanised instruments comprising an air-driven handpiece and removable instrument tips. Sonic handpieces (Fig 3-13) use air pressure to create mechanical vibrations that in turn cause the instrument tip to vibrate. The instrument tip of a sonic handpiece vibrates between 3,000 to 8,000 cycles per second (3-8 kHz). Sonic instruments are less efficient in removing calculus deposits than ultrasonic instruments, because the sonic instrument tip vibrates at a slower rate. The

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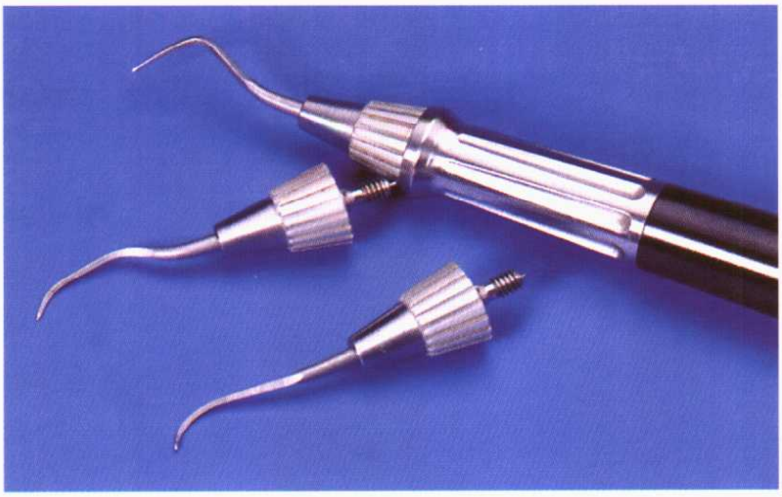


图 3-13　声波手机是由空气驱动的

Fig 3-13　Sonic handpiece is an airdriven hand piece

slower rate of vibration of the sonic instrument tip results in fewer instrument strokes per second for calculus removal. However, despite this difference, studies have shown that clinical outcomes following sonic and ultrasonic instrumentation for management of chronic periodontitis are equivalent.

声波手机的工作尖

声波手机工作尖也是通过一专门器械直接旋入手机。不同公司的工作尖不能相互替换，绝大多数声波系统只使用标准型号的工作尖。因而声波系统只能用于清除龈上牙石；如果工作尖易于进入牙周袋则也可清除龈下牙石。由于声波系统直接与牙椅连接，没有贮水设备，故其无法用抗菌药物进行荡洗。

Inserts for sonic handpieces

The instrument tips screw directly onto the handpiece with the use of a special tool. Again, the tips are not interchangeable from manufacturer to manufacturer, and most units are limited to standard size instrument tip designs. For this reason, sonic instruments are restricted to the removal of supragingival or subgingival deposits if tissue distension permits easy insertion of the tip. Sonic handpieces cannot be used with antimicrobial solutions as they connect directly to the dental unit and have no ability to accommodate a fluid reservoir.

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气磨系统

气磨系统相对较新，目前其效能评价仅限于研究资料，它在清除外源性色素沉着（如茶、咖啡和烟）方面效率更高。

Air-Abrasive Systems

Air-abrasive systems are relatively new but there is limited research data on the efficacy of these systems. They appear to be more efficient in removal of extrinsic stain, e.g. tea, coffee or tobacco.

超声洁治技术要领

- 在多数情况下，应选择低功率。若牙石坚硬则可用中等强度的功率，高的功率没有必要使用。研究表明高功率并不比中等功率更有效，而且它存在增加根面损伤的风险。
- 调整工作尖直至水雾出现或伴有水滴为止（图3-14）。
- 握持姿势保持轻松。
- 采用口内或口外支点。
- 将工作尖对着结合上皮，尖长轴与牙面成0～15°角，尖与牙石最冠方接触。
- 使用器械时应该用轻的压力，中等程度压力（更不用说重压力了）都会降低工作尖的效率。

Ultrasonic Techniques

- Use a low power setting for most situations. For tenacious calculus, a medium power setting can be used. It is not necessary to use the high power setting; studies have shown that this setting is no more effective than a medium power setting and it may increase the risk of root surface trauma/damage.
- Adjust fluid until a fine mist or a mist with fluid droplets is observed around the instrument tip (Fig 3-14).
- Maintain a light, relaxed grasp.
- Use an intraoral or extraoral finger rest.
- Position the tip with the point directed towards the junctional epithe lium and the length of the tip at a 0° to 15° angle to the tooth surface. Apply the point of the instrument tip against the uppermost edge of the deposit.
- A digital action is then used with light pressure; moderate let alone firm pressure decreases the effectiveness

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图 3-14 使用超声洁治器时应有水雾出现

Fig 3-14 Ultrasonic mist is produced when using the ultrasonic scaler

- 保持工作尖一直不停、轻压、重叠式运动，并要涵盖整个牙面。

研究表明超声系统与手用器械一样有效，并有更多的优点（表 3-3）。

of the instrument tip.

- Keep the instrument tip moving at all times, with multiple, light, overlapping strokes to cover the entire tooth surface.

Ultrasonic instrumentation has been shown to be as effective as hand instrumentation and to have several advantages over hand and instrument alternatives (Table 3-3).

牙周探针

多个厂家生产 ODU 探针，其刃部形状与 Gracey 1/2 刮治器相似（图 3-15），工作刃的头细，易于进入窄袋，能灵敏地感觉到根面情况（如龈下牙石，根折线及根面沟等）。

Periodontal Explorer

The ODU explorer is available from several manufacturers and is designed with a similar shank pattern to a Gracey 1/2 curette (Fig 3-15). The explorer has a fine tip, which allows easy access to narrow pockets for sensitive root surface exploration (for subgingival deposits, root cracks or grooves).

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表 3-3 手用器械与超声器械的比较
Table 3-3 Hand vs. ultrasonic instrumentation

超声器械	手用器械
多种作用机制：气穴作用、声波振动、流水冲洗、机械运动	只有一种作用机制，即机械运动
在一定距离内就可破坏细菌	只有在器械与牙面接触时，才能清除牙石和菌斑
可将牙周袋中的污物及细菌冲出	某些污物可残留于牙周袋内对组织产生不良刺激
工作尖的头小（0.3~0.6 mm）	工作刃宽（0.76~1.0 mm）
工作尖的头可 360° 全方位运动，且对于各牙面的清洁效率都很高	只有单侧工作刃
清除牙石的时候对牙的侧向力小，且手用的力量也小	去除牙石时要用中到重度的侧压力
清除牙石所需时间少	刮治所需的时间长
易于进入牙周袋，而且袋壁很少被撑开	须将工作刃放在牙石根方，会使袋壁撑开
组织损伤小，愈合快	组织易受损伤且愈合慢
去除牙骨质少	牙骨质可被刮除
无须打磨	需经常打磨

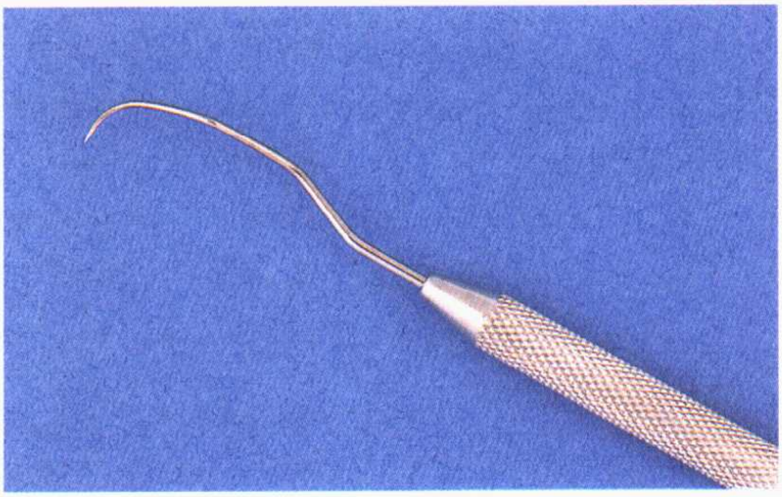


图 3-15 ODU 探针
Fig 3-15 The ODU explorer

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手指劳损

经常使用超声或手用器械的临床工作人员应考虑使用依据人体工效学设计的器械来减少职业性、反复的手指紧张，这种紧张可造成腕管综合征（Carpel Tunnel syndrome，CTS）以及身体上部其他组织的神经炎症，这些危险因素在另一本书中（*Decision-Making for the Periodontal team*）有详述。图 3-16 显示在使用器械时手各个部位的用力情况。产生CTS的原因是：通过腕管中央、分布于手掌底部的神经受压或发生炎症，其手部症状包括：手指针刺感、麻木、疼痛。

Repetitive Strain Injury

Clinicians involved in regular use of hand and ultrasonic instrumentation should give careful thought to the use of ergonomically designed instruments to reduce occupational repetitive strain in the hands. This can lead to Carpel Tunnel syndrome (CTS) and other upper body neuropathies, the risk factors for which are discussed in more detail in the second book in this series (Decision-Making for the Periodontal Team). Fig 3-16 indicates the areas where pressure points develop. CTS specifically results from inflammation or pressure to the median nerve of the wrist as it passes through the carpel tunnel at the base of the palm of the hand. Symptoms in the hand

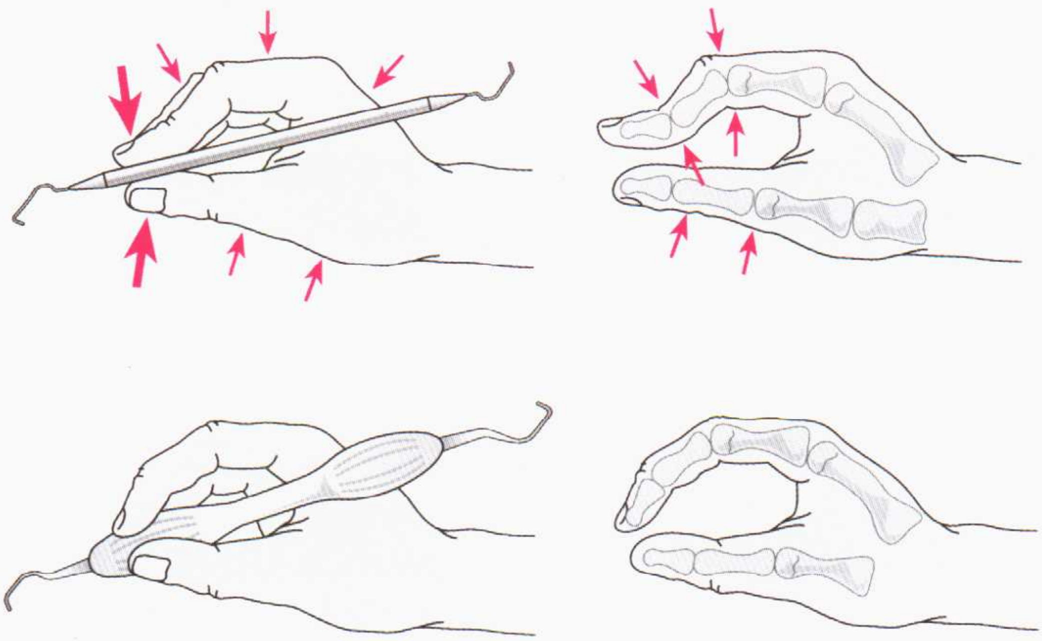


图 3-16　使用手用洁治器时手指各部位的用力情况

Fig 3-16 Pressure points when undertaking periodontal instrumentation

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include:

- tingling
- numbness
- pain.

目前认为六角形的金属器械柄可使手指更好用力，因为其握持更加方便。图3-17和图3-18显示依据人体工效学设计的器械，其柄粗，由硅制成。这样可使手指分开，只需用轻压就可握持器械。

Metallic hexagonal-shaped instrument handles are thought by some to increase the pressure on important regions within the hand, due to the close "pinch-grip" needed to hold the instruments. The clinical illustrations in Figs 3-17 and 3-18 demonstrate instrumentation that is more ergonomically designed, with thick silicone handles to separate the fingers and facilitate a lighter grip.

临床要点

- 近年来有研究表明超声/声波及手用器械清除牙石的效率无明显差异。

Conclusions of Clinical Importance

- Recent research has shown that there appears to be no difference in the efficacy of debridement using ultra-

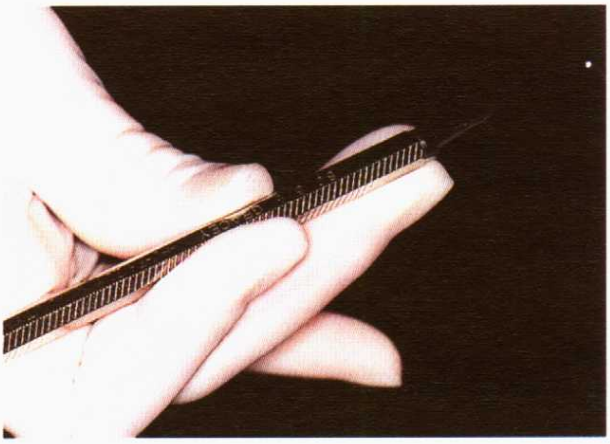


图3-17 握持六角形的手柄须用较大的力气

Fig 3-17 Hexagonal-shaded handles should be pinched to ensure a sound grip

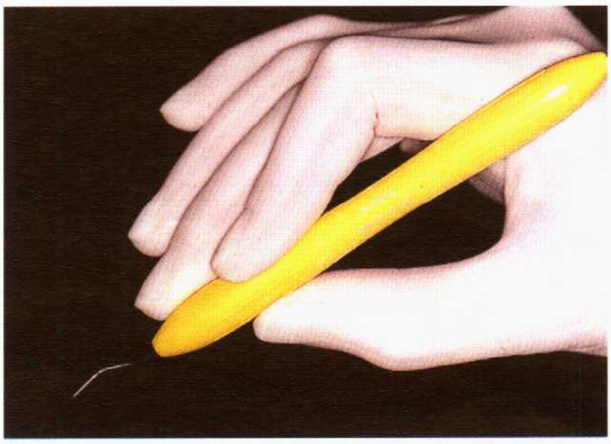


图3-18 符合人体工效学设计、硅制手柄；只需轻压就可握持牢固

Fig 3-18 An economically designed silicone handle is held lightly

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- 超声器械手感差，临床工作人员应先用超声器械，再使用手用器械，才能完成整个洁治过程。

sonic/sonic and hand instruments.

- With the loss of tactile sense when using an ultrasonic scaler, clinicians may prefer to commence debridement with an ultrasonic scaler and complete the debridement with hand instruments.

- 应考虑选择降低手指劳损危险性／发生率的器械。

- Careful thought should be given to the choice of instruments that will reduce the risk/incidence of repetitive strain injury.

- 在均使用电动供水系统前提下，抗菌药物荡洗和水荡洗所产生的临床疗效无差异。

- Antiseptic irrigants have been shown to offer no advantages over water in improving clinical outcomes when powered instruments are used.

拓展阅读
Further Reading

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第4章 全身性危险因素的处理

Managing Systemic Risk Factors

目 的

牙周炎患者常伴有一种或多种全身性疾病，这些疾病能加重牙周炎的发展，因此制定治疗计划时必须将其考虑在内（图4-1）。本章的主要目的是为开业医师提供临床指南，其作为系统治疗计划的一部分，可用于处理牙周炎中最重要且最常见的危险因素。

Aim

Patients with periodontitis frequently present with one or more systemic conditions that increase their risk of developing periodontitis and which must be considered when planning treatment (Fig 4-1). This chapter aims to provide practical guidance for practitioners in managing the most important and frequently occurring risk factors for periodontitis as part of comprehensive treatment planning.

要 点

阅读完本章后，读者应当能够：

- 了解危险因素的处理在牙周病治疗中的作用。
- 更好地了解怎样宣传特殊危险因素的控制方法，尤其是戒烟的心理辅导。
- 了解在治疗伴有危险因素的牙周炎患者中，与其他牙科医护人员及其他专科医师之间亲密合

Outcome

After reading this chapter, the reader should:

- understand the role of risk factor management in periodontal treatment
- be better informed on how to deliver specific risk factor management strategies, in particular, smoking cessation counselling
- understand the importance of close collaboration and team work with other members of the dental team and

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图 4-1 “非常抱歉，我们只对人类的牙龈疾病做基因检测！”
Fig 4-1 “I'm sorry, but genetic testing for gum disease is only done in humans”

作的重要性。

medical colleagues when treating patients with periodontitis and known risk factors for periodontal disease.

定　义

牙周炎危险因素的概念（包括风险评价）在《Understanding Periodontal Diseases: Assessment and Diagnostic Procedures in Practice》一书中有详细介绍。简而言之，所谓危险因素就是能

Definitions

The concept of periodontal risk factors, including risk assessment, was described in *Understanding Periodontal Diseases: Assessment and Diagnostic Procedures in Practice*. To recap, *a risk factor* is a factor

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增加特定个体某种疾病发生可能性的因素。危险因素大体包括:系统性危险因素(全身性)和局部危险因素(牙或位点相关性危险因素)。本章将详细阐述临床医师该如何治疗伴有全身性危险因素的患者。

that increases the probability that a disease may develop in a given individual. Risk factors can be broadly divided into systemic risk factors (subject-based risk factors) or local risk factors (tooth- or site-based risk factors). This chapter will deal specifically with the role of the clinician in managing patients who present with specific systemic risk factors.

危险因素的确定

处理危险因素的第一步就是要明确牙周炎患者存在着何种危险因素,这些信息可来源于病史采集和临床检查。必须记录完整的病史,包括正在进行的治疗,所用的药物和所患有的可能影响牙周诊断或治疗的其他疾患。病史采集在《Understanding Periodontal Diseases: Assessment and Diagnostic Procedures in Practice》一书中有详细介绍。牙周炎的危险因素中,最主要有下列几种:

- 家族史。
- 吸烟史。
- 患者的糖尿病状况。

这些都将在后面与牙周炎其他系统危险因素一起介绍。危险因素的处理应该作为牙周炎系统治疗中不可缺

Risk Factor Identification

The first step in managing risk factors is to identify precisely which risk factors the patient presents with. This information becomes apparent during history-taking and examination. A full medical history must be recorded,including details of ongoing medical treatment, current medications, and whether the patient suffers from any medical condition that might affect the periodontal diagnosis or therapy. History-taking has been covered in detail in *Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice*. From the perspective of risk factor management in periodontics, perhaps the most important considerations are:

- family history
- smoking history
- diabetic status of the patient.

These will be discussed below, together with other systemic risk factors for periodontal disease. Management of risk fac-

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少的一部分。

tors should form an integral part of the treatment of patients with periodontitis as part of a comprehensive therapeutic strategy.

牙周炎的遗传性危险因素

Genetic Risk Factors for Periodontitis

许多研究都支持以下观点：基因在决定牙周炎易感性中发挥着重要作用。众所周知，宿主反应在疾病病因中发挥着关键作用，而参与宿主反应的各种因素均由特定基因控制。宿主对龈下菌斑反应迟钝（低反应性）或反应过强（高反应性）均可提高牙周炎的发病风险。例如，患有罕见的家族遗传性疾病如掌跖角化综合征（Papillon-Lefevre syndrome；PLS）的患者，由于中性多形核细胞（polymorphonuclear leukocytes，PMNL）反应低下，牙周炎发病风险将增加。另一方面，防御细胞的高反应性（原发性或功能性高反应）可能导致组织的破坏。宿主在抵抗菌斑的炎症反应中一些细胞（如PMNLs和巨噬细胞）迁移至牙周组织，分泌过多的破坏性酶和调节因子，间接破坏牙周软硬组织。

A large body of evidence now supports the theory that genetic factors play an important role in determining susceptibility to periodontitis. We now realise that the host response has a key role in disease pathogenesis and that components of the host response are under genetic control. Both under-activity (hypo-responsiveness) and over-activity (hyper-responsiveness) of components of the host response to the presence of subgingival plaque can place individuals at increased risk of periodontitis. For example, hypo-responsive polymorphonuclear leukocytes (PMNL) are associated with increased risk for periodontal disease in the inherited condition, Papillon-Lefevre syndrome (PLS). At the other end of the spectrum, hyper-responsive defence cells (either constitutively or functionally hyper-responsive) may cause excessive tissue damage. Such cells (e.g. PMNLs, macrophages) migrate into the periodontal tissues and secrete excessive levels of destructive enzymes and mediators as part of the inflammatory host response against plaque bacteria, resulting in breakdown of surrounding periodontal hard and soft

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虽然已有研究证实了基因在牙周炎发生发展中的重要作用，我们可以这样推测：患有罕见综合征如PLS的患者都有PMNL功能的缺陷，其中绝大部分患者伴有牙周炎的表现，对于这部分患者，我们仍不能完全了解其基因型（基因组成）。而且，目前我们也无法通过改变牙周炎患者的基因结构来降低其牙周炎的发病风险。因此，在检查牙周炎患者时，尤其是患有侵袭性牙周炎的年轻患者，询问其家庭成员的患病情况还是很重要的。

tissues, in a manner referred to as "collateral damage".

While research has identified an important role for genetic factors in periodontitis, and we may be able to postulate that individuals with rare syndromes such as PLS possess defective PMNLs, in the majority of patients who present clinically with periodontitis we are not yet able to make meaningful statements about their genotype (their "genetic make-up"). Furthermore, we are not in a position to be able to alter a genetic profile so as to reduce the risk of periodontitis. It is, however, important to ask about other family members when examining a patient with periodontitis, particularly young patients with aggressive forms of the disease.

侵袭性牙周炎有家族遗传倾向，提示该病可能与基因有关。任何一种具有家族遗传倾向的免疫缺陷疾病的表现可能都不会很明显，例如，有PMNL功能缺陷的患者可能易患牙周炎，但有些患者除被诊断为牙周炎外并无其他任何临床体征或症状，且患者看起来很健康。一份详细的家族史应包括患者的兄弟姐妹是否有牙周疾患、父母亲是否有早期缺牙史等，这些在牙周炎患者的病史收集中都是很重要的信息，其有助于牙周炎的诊断，并可了解患者所患疾病潜在的自然病史，如他们的基因构成在临床上如何表现（即表现型）。

Aggressive periodontitis tends to occur in families, suggesting a genetic basis to the disease. The precise nature of any immune defect that is inherited in families may not be apparent. There may be a defect in PMNL function, for example, that predisposes the patient to periodontitis, but does not manifest as any other clinical sign or symptom, and the patient appears to be medically healthy (other than a diagnosis of periodontitis). A detailed family history, including questions about whether brothers or sisters have periodontal problems, or whether the patient's parents lost their teeth early, are also an important part of the in-

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formation gathered from patients with all forms of periodontitis. Such data help to inform the diagnosis and provide a "window" on the potential "natural history" of that patient's disease, i.e. how their genetic make-up maybe expressed clinically (their "phenotype").

基因易感性的检测

目前已有针对牙周炎患者基因状况的商业检测系统。这种牙周炎易感性检测(periodontal susceptibility test, PST)可通过指尖取血样。检测牙周炎相关基因型 (periodontitis-associated genotype, PAG), 即检测编码白介素-1的特定基因是否存在多态性。基因多态性并不是基因突变, 多态性存在于人类的基因组中。PST鉴定单核苷酸是否存在多态性, 即在基因特定位点DNA双链分子中是否存在单个碱基对的变化。已有研究证实携带这些多态性基因的个体 (如PAG阳性) 针对特定的细菌会产生更多的白介素-1, 由于白介素-1在牙周炎发生过程中起重要作用, 所以这些个体更可能发生牙周炎。实际上, 一些研究证实了PAG阳性的吸烟人群发生牙周炎的机率是PAG阴性吸烟人群的7倍(虽然另外一些研究未予以证实)。

Genetic Susceptibility Testing

A commercial test for genetic status in periodontitis patients has been developed. This is the Periodontal Susceptibility Test (PST), which is performed on a finger-prick blood sample. This tests for what has been called the Periodontitis-Associated Genotype (PAG), the presence of specific polymorphisms in the gene that codes for interleukin-1 (IL-1). A polymorphism is not a mutation in the gene, and polymorphisms exist throughout the human genome. In the case of the PST, single nucleotide polymorphisms (SNPs) are identified, in which there is a single change in the base pair sequence in the DNA molecule at specific points in the gene. Research has suggested that individuals who possess these specific polymorphisms (i.e. are PAG-positive) produce more IL-1 for a given bacterial challenge, and in view of the importance of IL-1 in periodontal pathogenesis, they are therefore more likely to have periodontal disease. Indeed, some studies have suggested that PAG-positive patients who smoke are up

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这就引发了一个问题：在牙周炎形成之前、治疗期间或是支持治疗阶段，对PAG阳性的患者的处理是否应当有别于PAG阴性患者？目前并没有足够的证据表明可以依据基因检测结果（如PST）而采取不同的治疗方法。例如，有关PAG和牙周炎间具有相关性的研究仅见于吸烟者。如果研究对象也包括不吸烟人群，那么就不存在这种相关性。而且有关特殊基因和牙周炎相关性的研究只在特定人群（尤其是白种人）中进行，其他种族并未进行这类研究。因此，以特殊基因为基础的基因检测并不适用于所有患者。值得注意的是，在英国和欧洲其他国家所进行的研究也表明，诸如PST的基因检测并无益于这类人群的筛选，但在将来这些检测很可能为危险因素的确定、早期诊断、改进治疗方案提供强有力的科学依据。然而，基因和疾病之间可能并没有直接相关性，例如，特定基因的存在并不一定直接导致疾病的发生。相反，遗传因素与其他危险因素（如吸烟）间可能存在相互作用，因而基因表型可能只有在其他危险因素存在下的情况下才与疾病间具有相关性。

to seven times more likely to have severe periodontitis compared to PAG-negative smokers, although other studies have failed to identify such an association.

This raises the question, if a patient is PAG-positive, should they be managed any differently from those who are PAG-negative, either before periodontal disease has developed, during periodontal treatment, or during the supportive phase of periodontal therapy? At the present time, there is simply not enough evidence that patients should be managed any differently on the basis of available genetic tests such as the PST. For example, the association between PAG and periodontitis was only seen in smokers. When non-smokers were included in the analysis, no association was apparent. Furthermore , associations between particular genes and periodontal disease have only been demonstrated in certain populations (typically, white Caucasians), and not in other racial or ethnic groups. It is clear, therefore, that genetic tests based upon specific genes may not apply to all patients. Importantly, studies in the UK and Europe indicate that a test such as PST is of little benefit for these populations, but the future holds exciting possibilities for risk factor identification, early diagnosis, and improved management strategies that have a strong scientific basis. Finally, the associations between genes and

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disease may be indirect, i.e. the presence of a certain genotype does not directly impact on the disease. Instead, there may be interactions between genetic factors and other risk factors (such as smoking) and, therefore, the genotype may only be relevant if other risk factors are also present.

基因检测结果的意义及其对患者造成的影响

所有评价PAG和牙周疾病间关系的研究表明，许多PAG阳性者并未患牙周疾病，而许多PAG阴性者却患有牙周疾病。很明显，通过PST检测的PAG的状况并不会对所有患者的牙周状况造成直接影响。但进行任何一种基因检测前都应将患者的顾虑考虑在内，并告知患者检测的相关内容。基因检测在理论上对患者具有负面影响，例如，PAG阳性的患者可能会认为无论他们怎么努力都将不可避免地发生牙周疾病，因而不遵循牙周预防措施或口腔卫生保健计划。而PAG阴性患者则认为他们不易患牙周疾病，也就不进行菌斑控制。然而，就如同牙周疾病是由多种细菌而不是单一细菌感染引起的一样，牙周疾病的病因是多发性免疫/炎症反应。因此，牙周疾病很可能在本质上是由多基因而不是单基因引起的。也就是说，像PST这种单基因多态性的检测结果不可能作为绝大多数牙周炎患者是否存在基因危险因

What do genetic test results mean, and what is their impact on the patient?

In all the studies that have evaluated PAG and periodontal disease, there have been substantial numbers of patients who were PAG-positive who did not have periodontal disease and, conversely, large numbers of patients who were PAG-negative who did have periodontal disease. Clearly, PAG status (as identified by the PST) does not directly impact on periodontal status in all patients. Patient considerations must also be taken into account when performing any genetic test, and patients must be counselled before undergoing such a test. Genetic testing could theoretically have negative effects on individual patients. For example, a PAG-positive patient might think that they will inevitably develop periodontal disease no matter what they do, and they may therefore fail to comply with periodontal preventive strategies or oral hygiene programmes. Conversely, PAG-negative patients might believe that this makes them

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素的依据。

safe from periodontal disease, and they may also fail to comply with plaque control requirements. However, just as periodontal disease is polymicrobial in nature (not caused by a single pathogen), it is also polyimmune/inflammatory in aetiology. It is therefore likely that it is poly-genic rather than monogenic in nature and therefore a single gene polymorphism, like those tested with the PST, is unlikely to explain the disease risk in most patients.

总之，我们应该谨慎应用牙周炎易感性基因检测的结果，但研究仍应深入，以明确基因状态和其他危险因素如吸烟之间的关系。目前没有证据表明有必要依据基因检测的结果对患者采取不同的治疗方法。

In summary, caution must be employed when interpreting the findings of genetic susceptibility tests for periodontitis. However, research will continue, and associations between genetic status and the presence of other risk factors such as smoking may become apparent. Currently, there is no evidence to suggest that patients should be treated any differently on the basis of genetic testing.

牙周炎的环境危险因素

Environmental Risk Factors for Periodontitis

药物性的牙龈增生

Drugs Associated With Gingival Overgrowth

苯妥英钠（抗惊厥类药物）、钙离子通道阻滞剂（如硝苯地平和阿莫地平等）和环孢菌素（一种免疫抑制剂）都可能引起牙龈增生（图 4-2）。牙龈增生的机制尚不明确，但涉及到牙龈和牙周组织中的炎症细胞、药物以及结缔组织中易感的成纤维细胞亚群三

Phenytoin (anticonvulsant), the calcium channel blockers (e.g. nifedipine, amlodipine) and ciclosporin (an immunosuppressant) are associated with gingival overgrowth (Fig 4-2). The precise mechanism for the overgrowth is not clear, but involves interactions between inflammatory cells in

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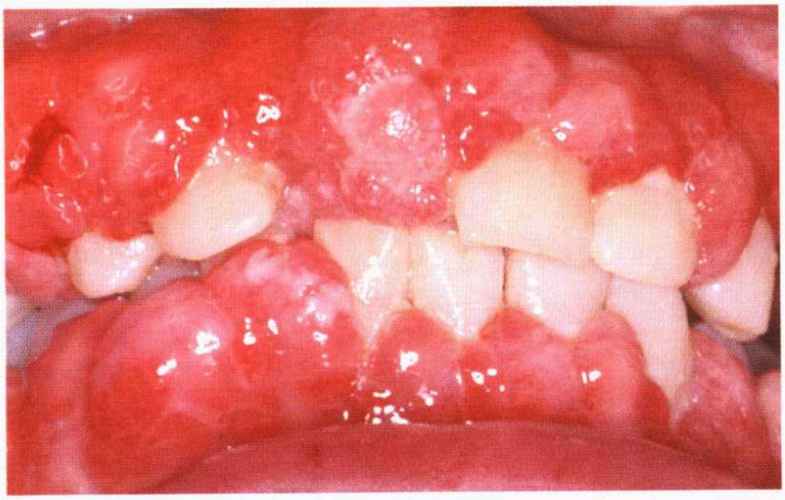


图4-2 服用环孢菌素引起的牙龈增生

Fig 4-2 Drug-induced gingival overgrowth in a patient taking ciclosporin

者之间的关系。牙龈增生不利于口腔卫生保健，从而引起牙周附着和牙槽骨丧失，导致牙周炎的发生。但并非所有服用这些药物的患者都会发生牙龈增生。

the gingival and periodontal tissues, the drug, and susceptible sub-populations of fibroblasts in the connective tissues. Gingival overgrowth renders oral hygiene more difficult, which may in turn lead to the development of periodontitis with attachment and bone loss. Not all patients who are taking these medications develop gingival overgrowth.

预防是治疗牙龈增生的第一步。如果病史中提示患者正在服用这些药物，应告之其可能会发生牙龈增生，并进行适当的口腔卫生指导，同时纳入常规口腔预防保健程序（包括加强口腔卫生指导和龈上、下菌斑的定期控制）。对于大多数患者，这种预防措施应该是足够了。

The first step in managing this problem is prevention. If the medical history reveals that a patient is taking one of these medications, then they should be informed about the risk of developing gingival overgrowth, provided with appropriate oral hygiene instruction (OHI), and entered into a regular preventive care programme involving reinforcement of OHI and regular prophylaxes to disrupt supra- and subgingival plaque deposits. For the majority of patients, this preventive regimen should be adequate.

临床检查牙龈增生的患者时，通

In those patients who present with pre-

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常可以发现由于菌斑的堆积，增生的牙龈组织有明显的炎症反应。因此治疗的第一步就是要进行彻底的牙周非手术治疗，包括口腔卫生指导和全口根面处理以清除菌斑和牙石。轻度增生的病例，经过处理后，随着炎症的消除，牙龈增生情况有所减轻，这有利于患者的菌斑控制。随后，患者应进行牙周支持治疗：即定期对患者进行口腔卫生宣教和全口的预防性治疗。

existing gingival overgrowth, clinical examination usually reveals that there is a clear inflammatory component to the overgrown tissues, as a result of plaque accumulation. The first step, therefore, is to provide thorough periodontal non-surgical treatment, including OHI and full mouth root surface instrumentation (RSI) to remove plaque and calculus deposits. Often, in cases of mild overgrowth, this treatment is sufficient to reduce the extent of the overgrown tissues as the inflammation resolves, which facilitates plaque control by the patient. The patient should then be enrolled into a regular supportive programme of OHI and full-mouth prophylaxis.

对于牙龈增生特别严重或者经常复发的病例，与医学专家的沟通是很重要的。可以让患者改服非钙离子通道阻滞剂型抗高血压药物，而服用环孢菌素者则可改服不会引起增生的他克莫司（tacrolimus）。服用环孢菌素后会引起两个副作用：牙龈增生和多毛症，而改用他克莫司则可避免牙龈增生。显然，更换药物须由开业医师，更常见的是经医学专家与牙科医师协商后做出决定。

Liaison with the medical specialist is important in cases of overgrowth that are particularly severe, or recur. It may be possible to switch the patient to a non-calcium channel blocking anti-hypertensive drug prescription. For those patients taking ciclosporin, an alternative that is not associated with overgrowth is Tacrolimus. Gingival overgrowth is one of only two side effects of ciclosporin medication that justification for a change to Tacrolimus (the other is hypertrichosis). Clearly, the decision to switch medication must be made by the medical practitioner or, more often, the medical specialist, after consultation with the dentist.

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对于牙龈增生严重的病例，可能需要用手术或激光切除。手术前，患者须经牙周非手术治疗以改善口腔卫生，减轻牙龈炎症。通过非手术治疗，牙龈炎症消退，增生程度减轻，从而有利于手术的进行。大多数药物性龈增生病例需要行牙龈切除术，尤其是严重增生的病例，有必要将其转诊给合适的专科中心。

For very severe cases of overgrowth, gingivectomy surgery maybe indicated using either a scalpel or a surgical laser. If surgery is to be performed, it is essential that the patient first undergoes non-surgical periodontal treatment to improve oral hygiene and reduce the inflammatory component of the condition. As the inflammation resolves following efficacious non-surgical treatment, the size of the overgrown tissues is reduced which makes the surgery easier to perform. In the majority of cases requiring gingivectomy, referral to an appropriate specialist centre is appropriate, particularly in severe cases.

艾滋病

尽管 HIV 阳性的患者更容易发生坏死性牙周疾病，但HIV的状况似乎不会影响慢性牙周炎的发生和发展。因此，HIV 阳性患者慢性牙周炎的处理方法和 HIV 阴性患者一样。

HIV Disease

Whilst necrotising periodontal conditions are more likely in HIV-positive patients, HIV status does not appear to impact on the development or progression of chronic periodontitis. HIV-positive individuals with chronic periodontitis should therefore be managed in the same way as HIV-negative patients.

坏死性牙周炎的处理将在第 6 章介绍。

The management of necrotising periodontal conditions is covered in Chapter 6.

牙周炎的危险行为因素

Behavioural Risk Factors for Periodontitis

吸　烟

吸烟是牙周炎的一个主要危险因素。已有研究显示，西方国家中 50%

Smoking

Smoking is a major risk factor for periodontitis, and research suggests that

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以上的慢性牙周炎可能由吸烟引起。戒烟有利于牙周炎患者，已戒烟的患者对牙周治疗的反应介于非吸烟和吸烟患者之间。然而，牙科医师一般不会建议患者戒烟，原因如下：

- 牙科手术过程中缺乏时间。
- 牙科医师缺乏专门训练。
- 患者不感兴趣。
- 牙科医师认为其他牙科建议（如口腔卫生宣教）更为重要。

然而，牙科治疗团队在指导患者戒烟中确实起着很重要的作用（图 4-3）。大多数患者每隔半年到自己的牙科医师处进行检查，而通常只有在身体不适时才会去看其他医生。此外，牙科团队中的各成员尤其是牙科临床技师已经过专门的训练，可以纠正患者的行为（如口腔卫生习惯），且他们也已掌握了许多戒烟的技巧。帮助戒烟是开展全国性卫生保健的前提。每年，患者与牙科团队间的大量交流资料表明，牙科团队是劝告戒烟的首要人选。早在1993年美国国家癌症研究机构就承认"牙科团队在戒烟中发挥着关键作用"，研究已经证实牙科医师在帮助戒烟过程中所起到的作用与其他医护

over 50% of cases of chronic periodontitis in Western populations may be caused by smoking. Stopping smoking is of benefit to periodontitis patients, with the response to periodontal treatment in former smokers being approximately mid-way between that seen in non-smokers and in current smokers. Dentists have, on the whole, not tended to involve themselves in providing smoking cessation advice. Some of the perceived barriers to providing smoking cessation advice include:

- lack of time in the dental surgery
- lack of training
- patient disinterest
- a belief that other forms of dental advice (e.g. OHI) are more important.

However, the dental team does have a very important role to play in smoking cessation (Fig 4-3). Most patients visit their dentist every six months, whereas they only tend to see their medical practitioner when they have a medical problem. Furthermore, members of the dental team (particularly dental hygienists) are already trained in modifying patients' behaviour (e.g. in terms of oral hygiene practices), and already possess many of the skills required in helping patients to quit smoking. Helping smokers to quit is a national healthcare priority, and the high number of patient-dental team interactions that occur each year suggests that the dental team is ideally placed as a pri-

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图 4-3　“你说什么，吸烟对牙龈有害？”
Fig 4-3 “What do you mean, smoking is bad for my gums?”

人员一样有效。

mary care provider of smoking cessation counselling. As early as 1993, the National Cancer Institute of America recognised that “dentists have a key role to play in providing smoking cessation advice” and research has shown that dentists are as effective as doctors and nurses in helping patients to quit.

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牙科医师必须记录至少有吸烟史的病史。对于吸烟患者，要登记患者吸烟的数量和烟龄以便计算吸烟总量，如患者每天吸烟的包数（20支为一包）×烟龄即为吸烟总量。必须告诉牙周炎患者吸烟对牙周组织的危害，并记录在案。还应告知患者吸烟将影响治疗效果，当然这并不能作为不治疗或施行非标准治疗的理由。应当询问患者是否愿意戒烟。与患者探讨这些问题并非在浪费时间，已有研究证实卫生保健专业人员的简短建议能使戒烟率达 2%～5%。

At the very least, dentists must record a medical history that includes a smoking history. The number of cigarettes smoked and the number of years for which the patient has been a smoker must be recorded, to enable calculation of the number of pack-years (i.e. the number of packs of twenty cigarettes each day multiplied by the number of years as a smoker). Periodontitis patients who smoke must be informed about the deleterious effects of smoking on the periodontium and this must be recorded in the patient's notes. Patients should also be advised that treatment outcomes are reduced in smokers, although this should not be seen as an excuse to either not provide treatment or to provide substandard care. Patients should also be asked whether they have considered quitting. Discussing these issues with patients is certainly not a waste of time — research has shown that brief advice from a healthcare professional can result in quit rates of 2-5%.

初级保健部门有关干预吸烟的五个关键步骤称为"5As"法，如框 4-1 所示。完成 5As 所需的时间并不多，但假如患者能够遵从此法戒烟，则是很有价值的。戒烟的步骤如图 4-4 所示。患者在"考虑戒烟前"阶段（安于现状的吸烟者）是不会考虑戒烟的。安于现状的吸烟者会说他们喜欢吸烟，对戒烟真的不感兴趣。对于这样的患者，5Rs 有利于强化戒烟的动机（框 4-2）。

The five key steps (the "5 As") to smoking intervention in the primary care setting are shown in Box 4-1. It does not take long to go through the "5 As", and it is extremely rewarding if a patient quits following intervention. The stages of quitting are illustrated in Fig 4-4. A patient in the "pre-contemplation" stage (a "contented smoker") is not yet ready to think about quitting. The contented smoker will report

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框 4-1　"5As"　方法

Ask　*询问患者的吸烟情况，并做记录。*

Advise　*通过提供清晰、明确和个性化的信息建议吸烟者戒烟。*

Assess　*询问患者是否愿意戒烟，如果愿意，则为他们提供帮助。*

Assist　*协助患者实施戒烟计划：制定戒烟日期、提供指导和推荐戒烟的手段如尼古丁替代疗法。*

Arrange　*制定戒烟日期后马上安排随访，祝贺他们所取的成功。假如病人放弃，则考虑原因。*

Box 4-1　The "Five As" Approach

Ask *Patients about amoking,and record the answer in the notes*

Advise *smokers to quit by providing clear,unambiguous and personalised information*

Assess *whether the patient is willing to make a quit attempt,and if so,then provide help With this*

Assist *the patient With a quit plan:set a quit date,provide counselling,recommend smoking cessation aids (e.g.nicotine replacement therapy)*

Arrange *a follow up soon after the quit date.Congratulate success.If the patient has lapsed,then consider the circumstances.*

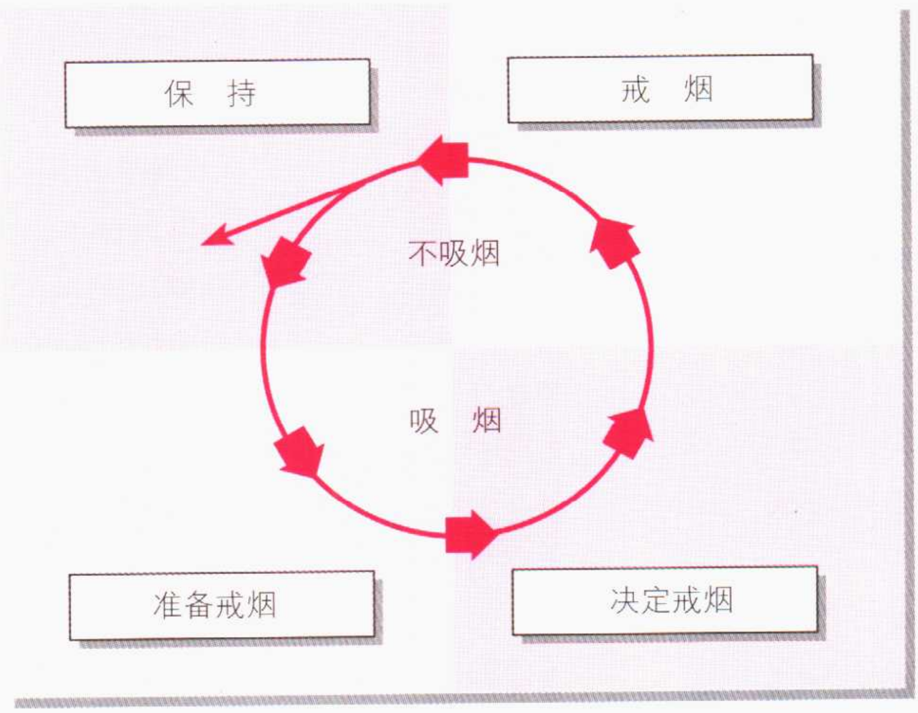


图 4-4　吸烟者的戒烟过程

Fig 4-4 The quitting cycle for smokers

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框 4-2　5Rs 方法

Relevance *让患者意识到戒烟的重要性。戒烟动机最为重要。*
Risks *尽量根据患者的不同情况，告知其不戒烟的危害。*
Rewards *告诉患者戒烟将会带来的好处：如促进健康、增加食欲、增强嗅觉、省钱和改善牙周状况。*
Roadblocks *告诉患者戒烟过程中将遇到的困难，如对戒断症状的恐惧、害怕失败、体重上升和缺乏外界支持等。*
Repetition *对安于现状的患者，每次到牙科医师处就诊时，要对其重复上述内容。大多数患者需要别人对其不断地劝说才能成功戒烟。*

对戒烟感兴趣的患者处于戒烟环中的"决定戒烟"阶段。这时患者考虑是否戒烟，并可能计划在几个月内戒烟。在这个阶段，牙科团队对于那些准备戒烟的患者帮助最大，如帮助决定戒烟开始日期，制定戒烟计划和提供

Box 4-2 The "Five Rs" Approach

Relevance – *make the importance of quitting relevant to the patient.Motivational information has the greatest impact if relevant to the individual*
Risks – *Explain the risks of not quitting smoking,and try to personalise this information for the patient*
Rewards – *identify rewards of quitting (e.g.improved health,better taste of food, enhanced sense of smell,saving money, better periodontal status)*
Roadblocks – *identify the patient,s barriers to quitting (e.g.fear of Withdrawal symptoms,fear of failure, Weight gain,lack of support)*
Repetition – *Repeat the above each time a contented smoker comes to the dental practice.Most smokers need repeated quit attempts before they succeed*

that they enjoy smoking, and they are not really interested in stopping. For this type of patient, the "5 Rs" are useful to enhance motivation to quit (Box 4-2).

The concerned smoker is one who is in the "contemplation" stage of the quit cycle. This patient is thinking about quitting, and probably has plans to try to quit within the next few months. This is the point in the cycle at which the dental team can be most

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具体的指导等，为他们推荐外界辅助手段（如戒烟中心的开业医师或专家），最终制定戒烟计划等。

effective in assisting the patient in their attempt to quit. A quit date should be determined, a quit plan developed, and practical counselling given. External sources of support (e.g. the medical practitioner, or specialist smoking cessation services) can be identified, and a definitive smoking cessation strategy should be formulated.

戒烟计划从戒烟日起实施，处于环中的"戒烟"阶段。这个阶段患者必须认识到完全戒烟的必要性，所有的烟都必须从患者的周围环境中撤离。

Smoking cessation strategies are employed in the "action" stage of the cycle at the time of a predetermined quit date. The patient should be aware that total abstinence is essential. All cigarettes should be removed from the patient's environment.

戒烟方法可分为非药物疗法和药物疗法两种。非药物疗法包括：

- 毅力。
- 来自专业卫生保健中心的建议和辅导。
- 自我辅助材料。
- 行为疗法。
- 催眠术。
- 针刺疗法。

戒烟的药物疗法包括：

- 尼古丁替代疗法，如尼古丁片剂、口香糖和吸入器；
- buproprion SR（缓释剂）（Zyban®）。

Smoking cessation strategies can be divided into non-pharmacological and pharmacological methods. Non-pharmacological methods include:

- willpower
- advice and counselling from the healthcare professional
- self-help materials
- behavioural therapy
- hypnosis
- acupuncture.

Pharmacological smoking cessation strategies include:

- nicotine replacement therapy (NRT) (e.g. nicotine patches, gum, inhalers)
- buproprion SR (sustained release) (Zyban®).

不同的戒烟方法成功率各不相同

The success of smoking cessation strat-

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(框4-3)。戒烟机构和药物干预的戒烟率最高。很多开业医师经过特殊培训后开始经营戒烟机构。在协助有戒烟意向的患者时，患者与医师间的沟通是很有必要的，尤其对那些愿意使用buproprion（此为处方药）的患者。buproprion最初用于抗抑郁症，后来发现服用该药后烟瘾可减轻。已有研究证实buproprion能有效应用于戒烟，且合理用药时是很安全的。然而，因其与其他药物之间的相互作用比较明显，故该药物的使用须在医师的指导下进行。

egies varies (Box 4-3). Support and pharmacological intervention provide the highest cessation rates. A significant proportion of doctors' practices with appropriately trained staffnow run smoking cessation clinics. Liaison with the medical practitioner is essential when assisting a patient in their quit attempt, particularly if the patient decides that they would like to use buproprion, as this can only be prescribed by a medical practitioner. Buproprion was originally marketed as an anti-depressant, but it was noticed that cravings for cigarettes were reduced when taking the drug. Studies have shown that buproprion is very effective in helping patients to quit smoking, and the drug, when properly administered, is safe.

框4-3　不同戒烟法12个月后的戒烟成功率

单纯毅力	*3%*
自助材料法	*4%*
采用卫生保健中心的建议	*5%*
采用卫生保健中心的建议加尼古丁替代疗法	*6%*
戒烟所	*10%*
戒烟所加尼古丁替代疗法	*20%*

Box 4-3 Twelve-month abstinence rates for different smoking cessation strategies

Willpower only	*3%*
Self-help materials	*4%*
Brief healthcare professional advice	*5%*
Briefhealthcare professional advice and nicotine replacement therapy	*6%*
Smokers clinic	*10%*
Smokers clinic and nicotine replacement therapy	*20%*

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尼古丁瘾从本质上说是一种慢性疾病，大部分戒烟者都会有复吸和再戒烟的经历。不同程度的烟瘾可以采用不同的处理方法。例如，中度成瘾者只需采取行为干预和尼古丁替代疗法，而重度成瘾者则可能需要联合药物治疗（buproprion）并加强行为疗法。尼古丁替代疗法主要通过减轻戒断症状发挥作用，使戒烟者能够耐受戒断症状而减轻烟瘾，有助于稳定情绪，集中注意力和处理紧急情况。尼古丁替代疗法不是用于治疗尼古丁成瘾，它可提供尼古丁却不会产生有害的烟雾。Buproprion通过抑制多巴胺的再摄取和改变去甲肾上腺素的活性而发挥作用，同时还可以使体重下降。Buproprion禁用于下列患者：

- 癫痫患者。
- 食欲减退或厌食症患者。
- 服用其他抗抑郁症药物者。
- 服用单胺氧化酶抑制剂者。

However, interactions with other medications may be significant and for this reason buproprion should only be prescribed by the medical practitioner.

Nicotine addiction is essentially a chronic disease. Most smokers who attempt to quit will cycle through periods of relapse and remission. Different levels of addiction can be treated differently. For example, mildly addicted smokers may require behavioural intervention and NRT only, whereas those with a severe addiction are likely to also need adjunctive pharmacotherapy (buproprion) and intensive behavioural therapy. NRT works by reducing withdrawal symptoms, reducing the smoking urge by sustaining tolerance, and may maintain mood, attentiveness and stress handling. NRT is not a cure for nicotine addiction, but provides nicotine without any harmful smoke. Buproprion works by inhibiting dopamine reuptake and altering noradrenaline activity. It also reduces weight gain. Buproprion should not be used in patients:

- with seizure disorders
- with a previous diagnosis of bulimia or anorexia
- taking other antidepressants
- taking monoamine oxidase inhibitors.

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牙周炎的危险因素－生活方式

精神紧张

精神紧张是牙周炎的一个潜在危险因素（图4-5）。精神紧张会对免疫功能产生不利影响，虽然其在牙周炎中的具体作用尚不明了，但已有报道表明，从生物学基础上看，牙周疾病和处事能力差之间似乎具有相关性。长

Life-style Risk Factors for Periodontitis

Stress

Stress is a potential risk factor for periodontitis (Fig 4-5). Stress has an adverse effect on immune function, and although the precise role of stress in periodontitis has yet to be elucidated, there appears to be a biological basis for associations reported



图4-5 “我告诉你，假如你不马上回家，帮我管管孩子们，我会得牙龈病的！”
Fig 4-5 “I tell you, if you don’t get home soon and help me with these children, I’ll get gum disease!”

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期以来，精神紧张被认为是坏死溃疡性龈炎的一个重要致病因子。已有研究证实那些应急能力(防御反应)差的患者更容易发生严重的慢性牙周炎。他们更可能放弃对自己疾病及治疗负责并采取防御态度，且认为自己比其他人更易控制现状。

between periodontal disease and poor coping strategies. Stress has long been considered as an important predisposing factor in necrotising ulcerative gingivitis (NUG). Research has also identified that patients with inadequate stress behaviour strategies (defensive coping) are at greater risk for severe chronic periodontitis. Patients with defensive coping are more likely to refuse to accept responsibility for their condition or treatment, adopt defensive attitudes and consider themselves to have better control over situations than others in the same position.

关于心理压力为何会影响牙周疾病有两种理论。精神神经模式认为应急能力较差会改变中枢神经的传导过程，抑制中枢免疫调节，激发炎症反应，因此对慢性炎症疾病造成负面影响。行为导向模式认为精神紧张引起行为的改变从而对健康产生负面影响。例如患者可能有很强的抵触情绪，忽视疾病，不服从治疗或产生焦虑情绪(可能采取其他方式如吸烟来镇定情绪)等。应急能力较差也可能使患者忽视口腔卫生，而且，牙周治疗过程常伴有疼痛和不适，费时且费用较高，这些也可能作为心理应激因子，从而产生不利于牙周健康的有害反应。近年来的研究证实牙周细菌能够利用应激产生的去甲肾上腺素和肾上腺素来促进自身繁殖，产生毒素。这些报道中的不同反应模式也许能阐明牙周病原体如

There are two theories as to why psychosocial stress may impact on periodontal disease. The psychoneurogenic model suggests that poor coping with stress results in alterations in neural processes that induce centrally mediated immune suppression and aggravate inflammation, thereby negatively impacting upon chronic inflammatory disease. The behaviour-orientated model considers that stress results in changed behaviour that in turn negatively impacts on health. For example, the patient may be very defensive in attitude, may make light of the disease, may not comply with treatment, and may be anxious (and possibly demonstrate other calming behaviour patterns such as smoking). Poor ability to cope with stress may also lead to neglect of oral hygiene. Furthermore, treatment of

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何直接利用宿主应激因子的机制。

periodontal disease is often associated with pain and discomfort and is time consuming and costly — factors that also may be psychological stressors, leading to responses that are deleterious to periodontal health. Recent research has demonstrated that periodontal bacteria are capable of utilising the stress hormones noradrenaline and adrenaline to enhance growth and virulence expression. These reported differential responses might underlie a mechanism whereby the periodontal pathogen can directly take advantage of a "stressed host".

很显然，牙科医师治疗精神紧张的方法是有限的。治疗过程中牙科医师应注意确保让患者既能接受信息，同时又不会产生抵触情绪。对于应急能力明显较差的患者，通过与医师的沟通交流，或转诊，可能有助于缓和其紧张情绪。通过上述这些方法，这些患者将会逐渐认识自我在牙周病处理中的重要地位。

Clearly, the means of managing stress in the dental practice are likely to be limited. The dentist should, however, be careful to ensure that patients receive information in such a way that it does not cause them to become defensive. For patients displaying overt signs of poor coping abilities, liaison with the patient's medical practitioner, with possible referral for stress management therapy may be useful. For those patients who have poor stress management, getting to know themselves through such therapy maybe an important part of managing their periodontal disease.

牙周炎的危险因素－代谢性疾病

糖尿病

糖尿病作为牙周炎的危险因素其控制程度似乎比诊断更为重要。因此，

Metabolic Risk Factors for Periodontitis

Diabetes Mellitus

The degree of diabetic control appears to be more important when considering dia-

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治疗伴有糖尿病的牙周炎患者时，询问糖尿病控制情况是很重要的。大多数糖尿病患者知道自己的病情是否已得到良好地控制。总体上说，最好将糖尿病患者预约在早晨就诊，并告知患者需在早餐后进行手术，术前仍需常规注射胰岛素（胰岛素依赖型）或服用降糖药物。对于糖尿病患者，常规的牙科治疗无需全身使用抗生素。

betes as a risk factor for periodontitis than the diagnosis of diabetes. Therefore, when treating a patient with diabetes, it is important to ask the patient how well controlled their diabetes is. Most diabetic patients will be aware of whether they are well controlled or poorly controlled. In general, it is best to schedule dental appointments for diabetic patients in the early morning, and they should be told to have their breakfast, insulin injection (if insulin controlled) or medication as normal prior to coming to the surgery. There is no indication to cover routine dental procedures with systemic antibiotics in diabetic patients.

糖尿病导致牙周炎患病率增加的原因在《Understanding Periodontal Diseases：Assessment and Diagnostic Procedures in Practice》一书中已有介绍。已有研究表明糖尿病患者伴发重度牙周炎的概率是非糖尿病患者的两倍。治疗有糖尿病的牙周炎患者时，应告之糖尿病和牙周炎之间的关系，并特别强调遵循口腔卫生指导、牙周治疗和牙周支持治疗的重要性。对于血糖控制较差的患者，应与内科医师会诊以明确原因。有研究发现成功的牙周治疗有助于血糖控制，因此，即使是控制较差的患者，也应当认真治疗牙周疾病。据估计，将近一半的糖尿病患者没有明确诊断，故对于那些牙周病情较严重的患者最好向其医生咨询，以对他们的糖尿病病情做恰当的评估。

The factors that contribute to increased risk for periodontitis in diabetic patients have already been described in *Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice*. Studies have shown that populations of diabetic patients tend to contain about twice as many patients with advanced periodontitis as do non-diabetic populations. When treating the diabetic patient with periodontitis, it is important to explain the relationship between the two diseases to the patient, and to emphasise in a positive way the importance of complying with OHI, periodontal treatment, and supportive care. Liaison with the medical practitioner is important in poorly controlled diabetic patients to ascertain the reasons for the poor control. There

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is also some evidence that successful treatment of periodontitis may facilitate diabetic control, and therefore, even in poorly controlled cases, periodontal treatment should be performed meticulously. Finally, it is estimated that nearly half of cases of diabetes are undiagnosed, and therefore in those patients with very aggressive forms of periodontitis it may be prudent to consult with the patient's doctor for appropriate diabetes evaluation.

牙周炎的其他系统性危险因素

其他系统性危险因素在《Understanding Periodontal Diseases：Assessment and Diagnostic Procedures in Practice》一书中均有讲述。其中血液病如白血病、粒性白细胞缺乏症、嗜中性白细胞白血病等，肉状瘤病，克罗恩病和有遗传倾向的疾病如低磷酸脂酶症和掌跖角化综合征。这些病相对少见，对于许多严重的疾病，最好先转诊到专业中心治疗。然而也有不少疾病在牙科就可以得到控制，对于这些患者，关键是强调预防，同时应进行合适的口腔卫生指导和定期的牙周支持治疗。

Other Systemic Risk Factors for Periodontitis

Other systemic risk factors for periodontitis have been described in *Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice*. These include risks such as haematological diseases (e.g. leukaemias, agran-ulocytosis, neutropenias), disorders such as sarcoidosis, and Crohn's disease, and inherited conditions such as hypophosphatasia and PLS. Many of these conditions are relatively rare, and for many of the more serious diseases, referral to a specialist centre may be indicated. However, many conditions can be managed in the dental practice setting, and for these patients an emphasis on prevention is key, with OHI tailored to the needs of the patient and regular supportive care.

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临床要点

- 系统性危险因素如吸烟和控制不良的糖尿病对牙周状况及治疗有不良影响。
- 牙科医师的职责是确定危险因素，记录于病历中，并采取合适的治疗方法。
- 危险因素的确定和处理应成为牙周患者系统性治疗的一个不可分割的部分。
- 对伴有危险因素的患者，和他们的内科医生会诊是很有必要的。
- 戒烟是牙周治疗的一个重要组成部分，牙科团队在戒烟过程中扮演很重要的角色。
- 最好的戒烟方法包括医师劝告和药物疗法（如尼古丁替代疗法）。
- 牙周炎易感性的商业化基因检测结果不影响治疗计划的制定。

Conclusions of Clinical Importance

- Systemic risk factors such as smoking and poorly controlled diabetes impact negatively on periodontal status and response to treatment.
- It is the dentist's responsibility to identify the presence of risk factors, document them in the case notes, and take appropriate action regarding management.
- Bask factor identification and management should form an integral part of the comprehensive treatment of patients with periodontitis.
- Liaison with the patient's medical practitioner is an essential requirement when managing patients with known risk factors.
- Smoking cessation forms a key component in the management of periodontitis. The dental team is well placed to provide smoking cessation counselling.
- The best smoking cessation strategies involve counselling and the use of pharmacotherapies such as nicotine replacement therapy.
- Commercially available genetic tests for susceptibility to periodontitis should not be used to inform treatment-planning decisions.

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拓展阅读

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第 5 章 局部危险因素的处理

Managing Local Risk Factors

目　的

临床检查通常能够发现牙周疾病的局部危险因素。本章的目的是提供牙周系统治疗中有关局部危险因素的处理方法。

Aim

Clinical examination of patients often reveals the presence of local risk factors for periodontal disease. This chapter aims to provide information on how to manage local risk factors as part of the overall treatment plan.

要　点

阅读完本章，读者应该能够：

- 熟悉影响牙周炎发展和治疗效果的常见局部危险因素。
- 更深入地了解殆创伤对牙周组织的影响及其处理。
- 了解多根牙根分叉形态的重要性。
- 进一步了解特定的局部易感因素的处理。

Outcome

After reading this chapter, the reader should:

- be aware of the more common local risk factors that may impact on periodontal disease progression and provision of treatment
- understand better the impact of trauma from occlusion on the periodontium, and how to manage occlusal trauma
- understand the importance of furcation involvement in multi-rooted teeth
- be better informed on how to manage specific local predisposing factors.

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定　义

多水平风险评价的概念在《Understanding Periodontal Diseases: Assessment and Diagnostic Procedures in Practice》一书中有讲述。简要地说，风险评价应该包括患者的全身、整个口腔、全口牙齿和牙周局部的状况等。需进行全面临床检查和X线检查以确定牙周局部危险因素（详见《Understanding Periodontal Diseases》一书的第七、八、九章）。

局部危险因素指影响牙齿及牙周支持组织，能导致或促进牙周疾病发生发展的局部因素。局部危险因素较难分类，但大致可分为解剖性和医源性两大类。

然而，某些危险因素可能同时归入两类，如𬌗创伤，由牙齿排列不齐或牙齿过度伸长引起时为解剖性因素，若由不良修复体引起则为医源性因素。因此，𬌗创伤将在本章中单独介绍。

Definitions

The concept of multi-level risk assessment was described in *Understanding Periodontal Diseases: Assessment and Diagnostic Procedures in Practice*. Briefly, risk assessment should be undertaken at the patient level, the mouth level, the tooth level and the periodontal site level. In order to identify local risk factors for periodontal disease, a thorough clinical and radiographic examination should be undertaken (Chapters 7, 8 and 9 of *Understanding Periodontal Diseases*).

Local risk factors can be defined as factors associated with the teeth and supporting tissues that may initiate or predispose to periodontal disease. They are difficult to classify, but can be broadly defined under two major groups:

- anatomical risk factors
- iatrogenic risk factors.

However, certain risk factors may fall into both groups, such as trauma from occlusion, which may result, for example, from malaligned or over-erupted teeth (anatomical risk factors) or poorly contoured restorations (iatrogenic risk factors). For the purpose of this chapter, trauma from occlusion will be discussed separately from the two major groups.

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殆创伤

殆创伤可分为两大类：

- 由于切牙覆殆覆盖关系而直接导致牙周组织损伤的殆创伤。
- 由殆干扰引起的、同时累及健康牙（原发性殆创伤）和牙周炎患牙（继发性殆创伤）的殆创伤。（详见《Decision-Making for Periodontal Team》一书）。

切牙创伤性殆关系

重度深覆殆造成咬殆时牙齿与牙龈组织相接触，导致软组织从根面分离，从而引起广泛性的牙龈退缩。切牙覆殆覆盖关系的分类见框5-1。从牙周病学观点看，安氏 Ⅱ 类和 Ⅲ 类（切牙）关系对牙周支持组织的影响最大（图5-1 和5-2）。随着牙龈的剥离，牙周附着随之丧失，常见于上切牙腭侧和下切牙唇侧。安氏 Ⅰ 类和 Ⅳ 类关系对牙周支持组织的影响最小。

Trauma from occlusion

Trauma from occlusion can be divided into two major categories:

- traumatic incisor relationships that result in direct damage to the periodontal tissues
- occlusal trauma arising from occlusal interferences that may affect both healthy (primary occlusal trauma) and periodontally-involved (secondary occlusal trauma) teeth (see *Decision-Making for the Periodontal Team*).

Traumatic Incisor Relationships

A complete overbite onto the gingival soft tissues can result in extensive gingival recession with the soft tissues being sheared away from the root surface during function. The nature of the incisal relationship can be classified (Box 5-1). From the periodontal point of view, the Akerly class II and III incisal relationships are most significant (Figs 5-1 and 5-2). With the stripping of the gingiva, loss of attachment occurs, most frequently in relation to the palatal aspect of maxillary incisors and the labial aspect of the mandibular incisors. Akerly class I and IV incisal relationships typically present with minimal, if any, effect on the periodontal supporting tissues.

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框5-1 切牙创伤性殆关系的安氏分类

Ⅰ类：下切牙撞击腭侧黏膜，且位于上颌前牙的腭侧龈缘之后

Ⅱ类：下切牙切缘刚接触到上前牙腭侧龈缘

Ⅲ类：深覆殆切牙Ⅱ类2分类导致下颌唇侧牙龈剥离

Ⅳ类：下切牙切缘接触上切牙腭侧，导致牙齿的过度磨损

Box 5-1 The Akerly classifications of traumatic incisor relationships

Class Ⅰ *Lower incisors impinge onto the palatal mucose, posterior to the palatal gingival margins of the maxillary anterior teeth*

Class Ⅱ *Lower incisors occlude onto the palatal gingival margins of the maxillary anterior teeth*

Class Ⅲ *A deep traumatic overbite (class Ⅱ division 2 incisal relationship) with shearing of the mandibular labial gingiva*

Class Ⅳ *Lower incisors occlude with the palatal surfaces of the upper incisors, leading to tooth wear by attrition*

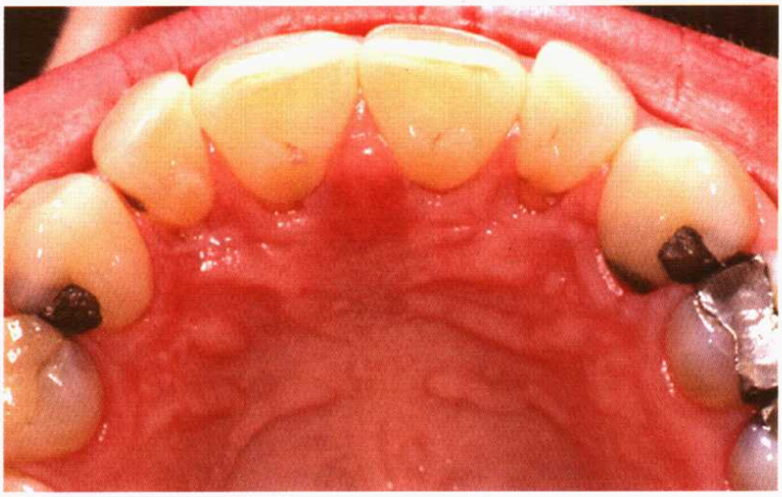


图5-1 切牙关系为安氏Ⅱ类引起的上切牙腭侧牙龈退缩

Fig 5-1 Akerly Class II incisal relationship. Note the recession in relation to the palatal aspects of the maxillary incisors

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图5-2　安氏Ⅲ类深覆殆：上颌切牙接触下颌切牙的唇侧牙龈（亦可见图 5-3）

Fig 5-2　Traumatic overbite (Akerly Class III incisal relationship). Notice how the maxillary incisors are impinging on the labial gingiva of the lower incisors (see also Fig 5-3)



图 5-3　患者张口时，可见深覆殆引起的创伤，下颌切牙区牙龈退缩，牙龈剥离（特别在左下颌切牙），并可见左切牙明显的磨损

Fig 5-3　When the patient opens their mouth, the consequences of the traumatic overbite can be seen. There is localised gingival recession affecting the mandibular incisors and shearing away of the gingiva, in particular, in relation to the lower left lateral incisor. There is also evidence of attritive toothwear affecting the left lateral incisor

形成创伤性殆关系的因素有：

- 重度Ⅱ类 2 分类切牙关系。
- 后牙缺失，尤其是余留前牙咬合过紧。
- 前牙修复体设计不良，无咬合接触，导致前牙伸长。

Predisposing factors for traumatic relationships include:

- a severe class II, division two incisor relationship
- loss of posterior support, particularly if associated with over-closure of the remaining anterior teeth
- poorly designed anterior restorations with no occlusal stops, leading to over-eruption of the incisors

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• 正畸治疗中。

严重牙龈组织退缩常不利于牙齿清洁，导致菌斑堆积引起牙龈炎症以及牙周组织的破坏（图5-3）。因此牙周治疗的第一步是恢复牙龈健康，即进行牙周非手术治疗和强化口腔卫生指导。单簇毛的牙刷可伸进龈退缩处进行清洁。可用软夹板来防止牙周软组织的进一步损伤，尤其是对有夜磨牙症的患者。

一旦牙周组织恢复健康就可以确定具体的治疗方案。由于治疗的精确性和复杂性，最好征求修复专科医师的意见后再制定治疗计划。治疗方案包括：

• 后牙区修复后能重建正常的垂直距离，并消除创伤性切牙关系。

• 设计有咬合止点的前牙修复体，如使用粘结性的金属腭板（图5-4）、复合树脂修复、全冠修复等。"Dahl" 法可为这些修复体提供前牙区的空间。现在很少使

• incomplete orthodontic treatment.

Frequently, deep localised recession defects will develop which are difficult to keep clean, leading to significant accumulation of plaque and the development of gingival inflammation and periodontal breakdown (Fig 5-3). The first line of treatment is to re-establish gingival health by undertaking non-surgical periodontal therapy and by providing intensive oral hygiene instruction (OHI). Single-tufted brushes may be particularly useful to clean into the recession defect. A useful preliminary treatment option is to provide a soft splint to prevent further damage to the periodontal soft tissues, particularly in those patients with a night time bruxing habit.

Once periodontal health has been re-established, definitive treatment options may be explored. Often, these may be intensive and complicated, and referral for advice and treatment planning by a specialist restorative dentist is likely to be required. Treatment options include:

• Provision of posterior support to re-establish the correct occlusal vertical dimension and eliminate the destructive incisal contacts.

• Restoration of the anterior teeth to provide occlusal stops, e.g. by the provision of adhesive metal palatal shims (Fig5-4), composite resin restorations, or carefully designed crowns. A "Dahl

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用传统的Dahl法了。外形良好的腭侧复合树脂修复可达到同样的效果（图 5-5）。

approach" may be required to increase space anteriorly for the provision of these restorations. The classic Dahl appliance is rarely used nowadays. Palatal composite restorations that have been carefully contoured are equally effective (Fig 5-5).

• 殆垫可代替软夹板长期使用（图 5-6）。

• Overlay appliances may be used as a long-term alternative to the soft splint (Fig 5-6).

• 更复杂的病例须进行正畸治疗、正颌手术、部分或全口的修复等。

• More complex cases may require orthodontic therapy, orthognathic surgery, or segmental or full-mouth rehabilitation.

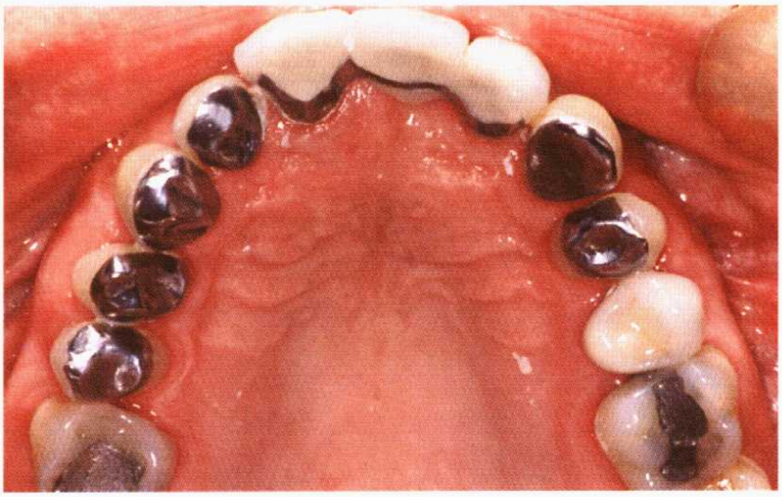


图5-4 粘结性腭板和前牙桥修复前牙，以提供稳定的殆关系

Fig 5-4 Adhesive palatal shims and anterior bridge-work to rebuild the anterior dentition and provide a stable occlusion

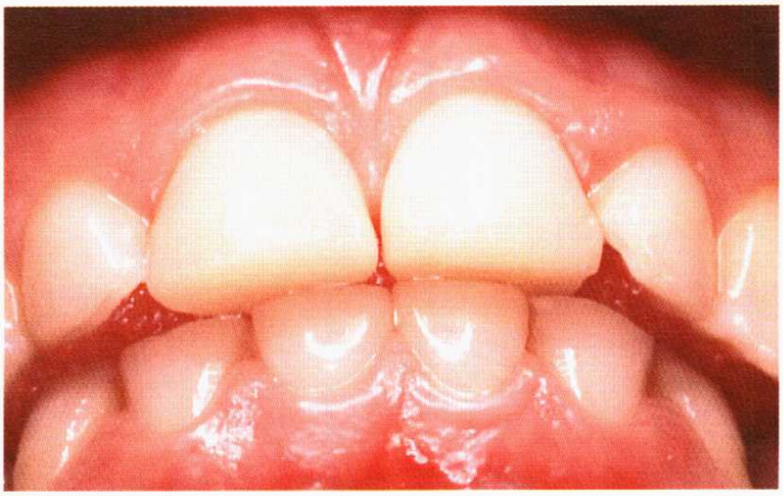


图5-5 腭侧使用复合树脂改良后的 Dahl 修复体以恢复垂直距离并提供稳定的殆关系

Fig 5-5 Palatal composite restorations used as an alternative to a Dahl appliance to increase the occlusal vertical dimension and provide occlusal stability

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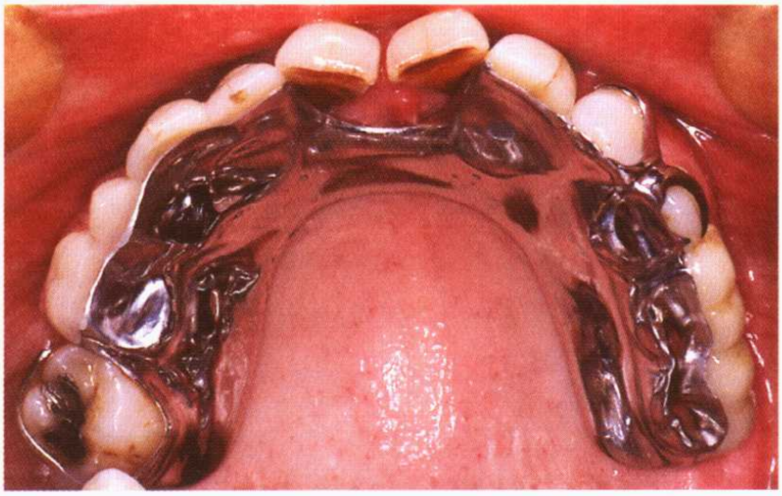


图5-6 局部义齿修复可防止殆创伤并提供稳定的殆关系

Fig 5-6 Overlay partial denture to prevent further trauma from occlusion and provide occlusal stability

殆干扰

修复治疗或正畸治疗后牙齿的咬殆形态和牙齿位置的改变可引起殆干扰和早接触。殆干扰导致的殆创伤临床上表现为：牙齿松动移位、疼痛、咬合无力、牙折裂、牙尖变平、牙齿磨损和颞下颌关节紊乱（TMD）等。

殆干扰引起的殆创伤可分为以下两种类型：

- 原发性殆创伤：咬合力过大导致正常牙周支持组织的损伤（图5-7）。

Occlusal Interferences

Occlusal interferences and premature contacts can arise when the occlusal morphology and position of teeth are altered following the placement of restorations or after orthodontic treatment. Interferences may lead to occlusal trauma that manifests clinically as:

- increasing mobility and migration of the teeth
- pain
- tenderness to percussion
- tooth fracture
- faceting of cusps
- bruxism
- temporomandibular dysfunction (TMD).

Occlusal trauma arising from occlusal interferences can be divided into:

- primary occlusal trauma in which a lesion results from application of excessive occlusal forces to a tooth with

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normal periodontal supporting structures (Fig 5-7).

- 继发性殆创伤：原有的牙周疾病造成牙周膜的破坏，牙周支持组织减少（图5-8到图5-10）。牙周支持组织丧失得越多，咬殆力作为辅助破坏因子的作用就越大。

- secondary occlusal trauma in which the lesion affects the periodontium of a tooth with reduced periodontal support because of current periodontal disease (Figs 5-8 to 5-10). The greater the amount of periodontal support that has been lost, the more significant the role of occlusion becomes as a co-destructive factor.

原发性或继发性殆创伤的定义主要用于临床诊断。不管是正常的还是已破坏的牙周支持组织，由殆创伤造

The designation of "primary" or "secondary" occlusal trauma is principally for diagnostic purposes. The changes that occur

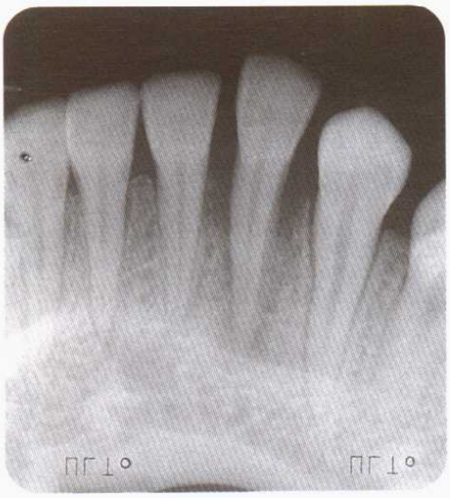


图5-7　创伤殆导致牙周膜间隙增宽，而牙周支持组织正常

Fig 5-7　Widened periodontal membrane space as a result of a traumatic occlusal interference in a tooth with normal periodontal supporting structures

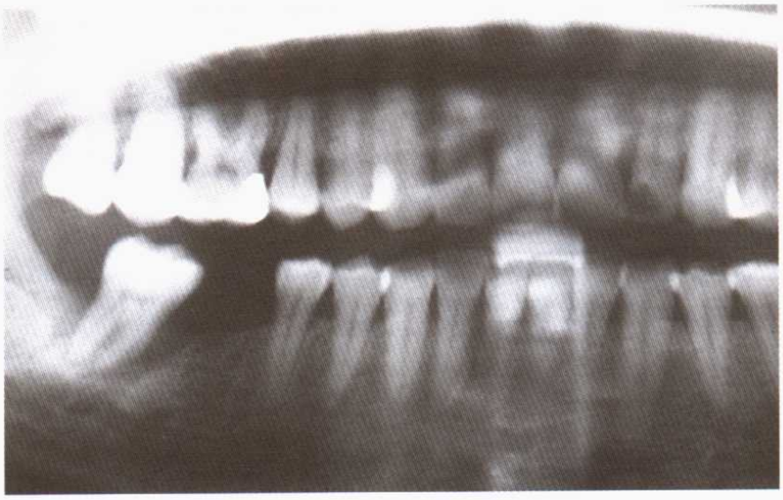


图5-8　原有的牙周炎和创伤殆造成的右下磨牙周围的弹坑样破坏（亦可见于图5-9和图5-10）。牙槽骨破坏达根尖。多数余留牙可见中到重度牙周炎

Fig 5-8　Crater defect around the lower right molar, which has pre-existing periodontitis and a traumatic occlusal interference (see also Figs 5-9 and 5-10). The bone loss has extended to the apex of the tooth. Notice that there is generalised moderate to severe chronic periodontitis affecting the rest of the dentition

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图5-9 殆干扰的临床表现(病例见图5-8):可见右下颌磨牙的颊斜面与上颌第二磨牙的腭尖接触

Fig 5-9 Clinical appearance of the traumatic occlusal interference (case illustrated in Fig 5-8). Note the deflective contact between the buccal surface of the lower right molar, and the palatal cusp of the upper right second molar



图5-10 继发性殆创伤,当患者处于牙尖交错位时,右下磨牙偏向舌侧,产生的摇晃力使原有牙周病患牙的牙周破坏加重

Fig 5-10 As the patient closes fully into the intercuspal position, the lower right molar is deflected lingually. This "jiggling" force affecting a tooth with pre-existing periodontitis has resulted in exacerbation of the destructive events in the periodontium, and is an example of secondary occlusal trauma

成的牙周改变都是相同的,可通过X线检查确诊。原发性殆创伤表现为牙周膜间隙增宽,呈漏斗状,但牙槽骨高度不变(图5-7)。而继发性殆创伤有明显的牙槽骨的破坏,受累牙周围呈凹坑样缺损(图5-8)。

in the periodontium as a result of trauma from occlusion are the same whether there is normal or reduced periodontal support. The diagnosis is often confirmed radiographically. Primary occlusal trauma results in a widened periodontal membrane space (PMS) and early “funnelling” but normal alveolar bone height (Fig 5-7), whereas secondary occlusal trauma presents with obvious alveolar bone destruc-

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殆创伤引起的病变通常由施加于牙周膜的张力和压力的交替作用，即所谓的摇晃力造成。因此很容易理解咬合过高的修复体是如何引起殆创伤的。在张力侧，血管通透性增加，胶原和骨沉积。在受压侧，血管通透性增加，胶原纤维降解，牙槽骨和牙骨质吸收。这种改变使牙周膜间隙增宽并呈漏斗状，牙周膜纤维失去原有正常的功能性排列，并可能造成牙齿的松动。长此以往，可导致牙槽骨的破坏，牙齿周围形成凹坑样破坏。

关于殆创伤是否会引起牙周炎尚有争议。然而，许多研究由于采用了不合适的动物模型并施加了过大咬殆力而导致了结果错误。现代研究已证实在没有菌斑刺激的情况下，殆创伤不会引起牙龈炎、牙周炎以及牙周袋的形成。在没有菌斑刺激、没有炎症的情况下，殆创伤导致的牙槽骨吸收在创伤性殆力去除后是可逆的（图 5-11）。

tion and a characteristic crater-defect surrounding the affected tooth (Fig 5-8).

The lesion of occlusal trauma usually arises following a succession of opposing tension and pressure forces on the periodontium (so-called "jiggling" forces). It is easy to imagine how these arise following placement of a restoration with a high occlusal contact. On the tension side there is increased vascular permeability, collagen and alveolar bone turnover, and on the pressure side there is increased vascular permeability, degeneration of collagen fibres, and bone and cementum resorption. These changes result in a widened, funnel-shaped PMS in which the periodontal fibres have lost their normal functional orientation, and the tooth may become mobile. Over time, significant alveolar bone loss may occur, resulting in a crater-like defect around the tooth.

There has been much interest in whether or not occlusal trauma can initiate periodontal disease. However, many of the studies that suggested that this might be the case were flawed by using inappropriate animal models and unrealistic occlusal forces. Research has now clearly shown that occlusal trauma does not initiate gingivitis, periodontitis or pocket formation in the absence of plaque-induced inflammation. Also, bone changes occurring as a result of trauma from occlusion without plaque-in-

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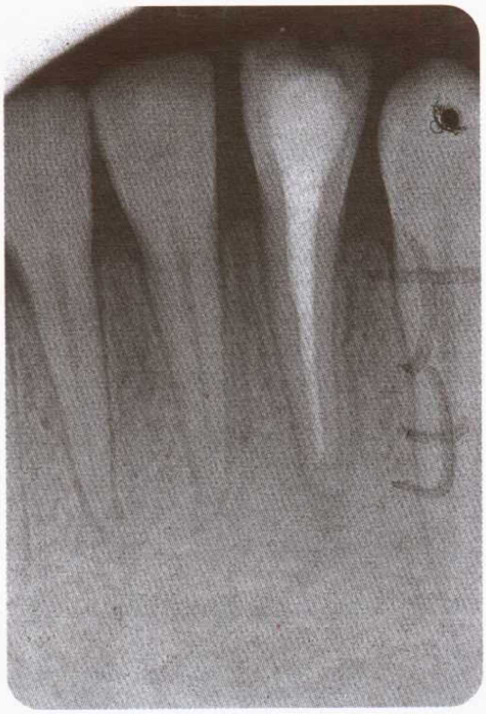


图 5-11 与图 5-7 为同一颗牙，去除殆干扰和根管治疗后，牙周膜间隙恢复正常

Fig 5-11 Same tooth as Fig 5-7. Following removal of the occlusal interference and root canal therapy, the periodontal membrane space has returned to normal

duced inflammation are reversible once the traumatising forces are eliminated (Fig 5-11).

原发性创伤殆造成的牙周组织的变化在外力去除后是可逆的，移位牙能够避开殆干扰的影响并在新位置上稳定下来，患牙并无结缔组织附着水平的改变。即殆干扰不会导致牙齿附着水平的丧失。原发性殆创伤的处理如下：

The changes seen in *primary occlusal trauma* are reversible when the force is eliminated, or the tooth moves out of the influence of the interference and stabilises in a new position. There is no alteration in the connective tissue attachment level to the tooth. In other words, the occlusal interference does not result in periodontal attachment loss. Treatment in this situation will involve:

- 通过病史采集和临床检查发现殆干扰。
- 将研究模型安置于处于下颌后退接触位的半调整式殆架上，这样的模型有助于发现殆干扰

- identifying the occlusal interference by careful history taking and occlusal examination
- study models mounted in the retruded contact position on a semi-adjustable articulator. Such models are useful to

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并可评价殆干扰去除后可能的效果。

help identify the interference and to plan and assess the likely outcome of removing the interference

- 通过选择性调磨来排除殆干扰。

- elimination of the occlusal interference by selective grinding.

治疗后，病变消除，症状减轻，X 线检查可见牙周间隙恢复正常。

Following treatment, the lesion should resolve, symptoms subside, and the widened PMS seen radiographically should return to normal.

继发性殆创伤是发生于已有牙周炎患牙上的创伤（图 5-8 到 5-10）。殆创伤会促进病变的发展，但不是牙周炎的始动因子，继发性殆创伤可以加重病变牙周组织的炎症反应的范围和程度，从而加重宿主对菌斑的炎症反应，导致牙周膜和牙槽骨的破坏。继发性殆创伤的处理如下：

Secondary occlusal trauma is trauma to a tooth that is already periodontally diseased (Figs 5-8 to 5-10). The occlusal trauma may accelerate the disease process, but cannot initiate disease. Secondary occlusal trauma may increase the intensity or spread of inflammation in already-diseased periodontal tissues, thereby exacerbating the inflammatory host response to the presence of plaque, and leading to increased breakdown of periodontal ligament and alveolar bone. Treatment of secondary occlusal trauma involves:

- 仔细检查，包括确定殆干扰和全口牙周 X 线检查。
- 首先治疗牙周炎，包括口腔卫生指导和彻底的根面平整以恢复牙周健康。
- 确定并消除殆干扰（详见前文）。

- careful examination, including identification of traumatic interferences, and full periodontal examination, with radiographs
- treatment of the periodontal condition as a priority. This will involve OHI and thorough root-surface instrumentation (RSI) to re-establish periodontal health
- identification and elimination of the deflective occlusal interference (see

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无论殆创伤存在与否，应先治疗牙周炎症。如果菌斑导致的牙周炎症仍然存在，即使消除殆干扰，也不能使已破坏的牙槽骨再生。

above).

Treatment of the periodontal condition should be a priority because, regardless of the traumatic forces present, the regeneration of alveolar bone will not occur following elimination of the interference if plaque-induced periodontal inflammation is still present.

检查松动牙时要注意松动并不一定由殆创伤引起。牙松动是由于牙槽骨丧失（如新近牙周破坏）造成，也可能是由虽有破坏但健康的牙周膜对咬殆生理性反应造成。临床上有活动性损害才能诊断殆创伤。

When examining a patient with mobile teeth, it is important to remember that mobility does not necessarily indicate trauma from occlusion. Mobility results from alveolar bone loss (e.g. following previous periodontal breakdown) and may simply be the physiological response of a healthy, albeit reduced, periodontium to normal function. A diagnosis of trauma from occlusion requires evidence of active injury.

解剖性危险因素

根分叉形态

根分叉病变为发生于多根牙的牙根间水平或垂直的附着丧失。根分叉病变可通过根分叉探针检查（图5-12）和X线检查发现（图5-13）。注意，临床上表现为明显根分叉病变，在X线上的表现不一定明显，反之亦然。框5-2示根分叉病变程度的分类。

Anatomical Risk Factors

Furcation Involvement

Furcation lesions arise when attachment loss occurs vertically and horizontally between the roots of multi-rooted teeth. Furcations are detected during the clinical examination using a furcation probe (Fig 5-12) and by radiographic examination (Fig 5-13). It is important to remember that furcation lesions that are evident clinically may not be evident radiographically, and vice versa. The classification system in Box 5-2 is used to grade the severity of the furcation involvement.

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图 5-12 弯曲的根分叉探针用于探查根分叉病变

Fig 5-12 Curved furcation probe used to detect a furcation lesion



图 5-13 X 线片显示根分叉病变牙槽间隔区有明显的骨丧失，附着丧失，这反映了水平向和垂直向的骨吸收的模式

Fig 5-13 Radiographic appearance of a furcation lesion with evidence of inter-radicular bone loss. This appearance reflects the pattern of attachment loss and bone resorption in both horizontal and vertical directions

框 5-2 根分叉病变的分类

Ⅰ度: *水平附着丧失小于牙齿颊舌向宽度的 1/3*

Ⅱ度: *水平附着丧失大于牙齿颊舌向宽度的 1/3，但没有完全贯通*

Ⅲ度: *完全的水平附着丧失，根分叉区牙周组织完全贯通性破坏*

Box 5-2 Classification system for furcation involvement

Class Ⅰ *Horizontal attachment loss less than one-third the buccolingual width of the tooth*

Class Ⅱ *Horizontal attachment loss greater than one-third the buccolingual width of the tooth, but not complete horizontal attachment loss*

Class Ⅲ *Complete horizontal attachment loss "through-and-through" destruction of the periodontal tissues in the furcation*

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很显然，根分叉病变发生于原有牙周炎的牙，牙周附着及牙槽骨破坏到根分叉水平。一旦病变累及根分叉，治疗就会变得复杂得多，因为牙周治疗难以到达根分叉处，患者也很难保持此处的卫生。原因如下：

- 根分叉处入口通常小于刮治器或超声洁治器的工作端，因此器械很难进入（图 5-14）。
- 多根牙根分叉表面常为凹面（图 5-14），菌斑易于堆积，而极难被器械清除。

Clearly, for furcation involvement to occur, there must be pre-existing periodontitis that has resulted in attachment and bone destruction down to the level at which the roots divide. Once the furcation is involved in the disease process, treatment becomes much more complicated because it is very difficult for the clinician to gain access into the furcation and for the patient to maintain effective oral hygiene in this area. Reasons include:

- The furcation entrance is often narrower than the tip of a curette or an ultrasonic tip, thereby preventing instrumentation inside the furcation (Fig 5-14).
- The furcal surfaces of the roots of multi-rooted teeth tend to be concave (Fig 5-14), creating plaque retentive areas that are extremely difficult to access for instrumentation.

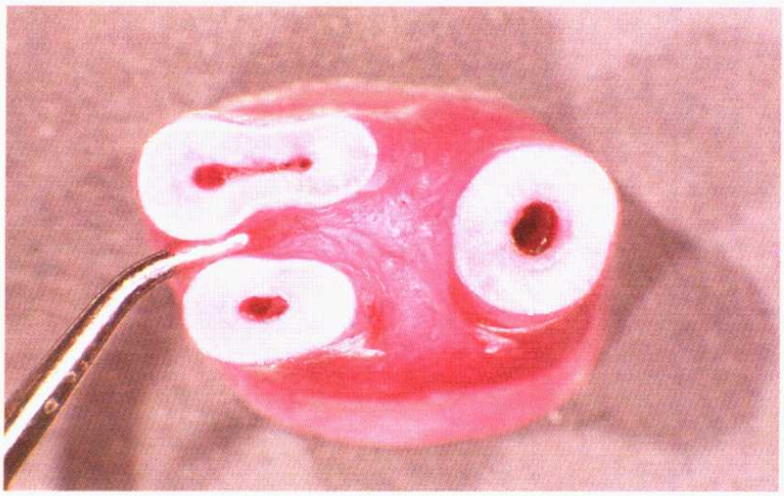


图 5-14 上颌第一磨牙颊侧根分叉入口太窄，使得器械无法进入，而不能进行充分的根面平整，同时可见近颊根内有凹面，此为菌斑滞留区

Fig 5-14 The entrance to the buccal furcation in this maxillary first molar is too narrow to permit access for adequate instrumentation. Note also the concave furcal (inner) aspect of the mesiobuccal root, creating a plaque stagnation area

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- 根分叉顶常位于根分叉入口处的冠方，更增加了根面平整的难度。

根据根分叉病变程度不同，可选用不同的治疗方法，但重点是有效控制菌斑，并教会患者使用牙间刷或瓶状牙刷以有效清洁根分叉区域。根分叉病变的非手术治疗包括口腔卫生指导和根面平整，这可能是有利于菌斑控制的根分叉形态惟一的治疗方法。非手术治疗治疗 Ⅰ 度根分叉病变可能最有效，对 Ⅱ 度病变效果稍差一些。

手术治疗方法适合于 Ⅱ 度和 Ⅲ 度根分叉病变，通常需要转诊给专业的牙周科医生。由于许多手术操作难度较大，对技术要求较高，因此手术医生最好要经过训练。根分叉病变的手术治疗方法及其优缺点在本书不做详述。手术方法大体如下：

- The roof of the furcation is located more coronally than the entrances to the furcation, further compounding the difficulties of undertaking RSI.

Treatment options for furcation-involved teeth are dependent on the severity of the furcation lesion. The focus must be on effective plaque control, and time must be spent educating the patient in the use of single-tufted and bottle brushes to clean the furcation effectively. Non-surgical treatment options for furcations include OHI and RSI, which may be the only treatment necessary providing that healing results in furcation morphology that is optimal for patient-performed plaque control. Non-surgical treatment is likely to be most successful in class I and, to a lesser extent, class II furcation lesions.

More complex surgical treatment approaches may be appropriate for class II and class III furcations, and frequently a referral to a specialist periodontist will be indicated. Given the technical difficulty of undertaking many of the surgical treatment options, most of which are very technique-sensitive, it is not recommended to perform these procedures without appropriate training. Detailed description of the various surgical options for furcations, together with an assessment of their advantages and disadvantages, is not within the scope of this book. Briefly, however, surgical treat-

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- 翻瓣后进行根面平整。
- 改变根分叉的形态以利于菌斑控制及维护。
- 隧道成形术将Ⅱ度根分叉病变转化为Ⅲ度根分叉病变，以利于用瓶状刷进行清洁。
- 采取引导组织再生治疗术(guided tissue regeneration；GTR)和骨引导组织再生治疗术(guided bone regeneration；GBR)，使破坏的组织再生。
- 对于牙周病变较重的牙根，采取牙根切除术或半牙切术切除。

须注意根分叉病变的预后较差，因此，不得已时也可选择拔牙。

ment for furcation lesions may include:

- RSI undertaken in conjunction with flap surgery to improve access
- furcationplasty to alter the furcation morphology to create better access for plaque control and maintenance
- tunnel preparation to convert a class II furcation in a mandibular molar into a class III furcation, which is easier to clean with bottle brushes
- guided tissue regeneration (GTR) and guided bone regeneration (GBR) to regenerate lost attachment
- root resection and tooth hemisection in which severely periodontally-involved roots are removed.

It should also be remembered that the prognosis for furcation-involved teeth tends to be poor. Therefore, extraction of the tooth must always remain an option.

釉　珠

釉珠为牙根表面比较少见的一种釉质水滴状结构（图5-15）。可单独存在，也可通过釉质嵴与釉牙骨质界(cemento-enamel junction；CEJ)连接，其表面没有结缔组织附着。如果存在于牙周袋中，很可能被误认为是牙结石，且易造成根面平整的困难。釉珠一旦被确定，可采用金刚砂磨除，但操作时要多加小心，因为较大的釉珠中也

Enamel Pearls

Enamel pearls are uncommon "droplets" of enamel found on the root surface (Fig 5-15). They may be isolated or linked to the cemento-enamel junction (CEJ) by a ridge of enamel. They have no connective tissue attachment. If present within a periodontal pocket, enamel pearls may be mistaken for calculus, and make effective RSI difficult. If identified, enamel pearls can be removed

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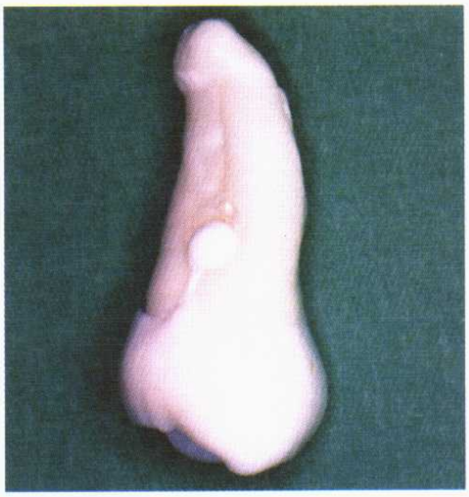


图5-15　图为拔除的双根前磨牙(融合根)牙根面上的釉珠。可见根颈部从釉牙骨质界通过釉质嵴连接的釉质突起

Fig 5-15　Enamel pearl on the root surface of a two-rooted (fused roots) extracted pre-molar. Note the cervical enamel projection extending from the cementoenamel junction to the enamel pearl forming a "bridge" of enamel along the root surface

可能含有牙本质甚至牙髓组织。

牙颈部的釉质突起

牙颈部的釉质突起(cervical enamel projections; CEPs)为釉牙骨质界伸入到多根牙根分叉区域形成的突起(图5-15)。CEP的牙周附着为上皮,因此成为牙周病发生发展的易感区。有研究证据表明若个别牙出现根分叉病变,而其余牙的牙周组织健康,则可能与CEP的存在有关。如果可能的话,最好将CEP去除,否则其将影响结缔组织的附着,但这通常只能在牙周手术中进行。

using a diamond bur, although care must be exercised as, occasionally, larger enamel pearls may contain dentine and possibly even pulp tissue.

Cervical Enamel Projections

Cervical enamel projections (CEPs) are projections of the CEJ into the furcation region of multi-rooted teeth (Fig 5-15). The periodontal attachment to the enamel of a CEP is epithelial, which may make these sites more susceptible to periodontal disease progression. There is evidence that isolated furcation involvements occurring in patients who are otherwise periodontally healthy may be associated with the presence of CEPs. Where access permits, the CEP should be removed because connective tissue will not attach to enamel. This, however, is a procedure that is usually only possible during periodontal surgery.

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牙根形态

牙根凹面沟有利于菌斑的堆积，易形成局限性且较深窄的牙周袋，而对根面平整反应不佳。腭侧凹面沟常发生于上颌侧切牙（图5-16），其可延伸至根尖1/3处。用传统的方法不能完全清除该处的菌斑和牙石，而应采取翻瓣术，小心修整根面以消除凹面沟。较深的凹面沟可能与牙髓系统相交通，在这种情况下，操作要极其小心。

Root Morphology

Root grooves are plaque retentive features that may be associated with localised, deep, narrow periodontal pockets that do not respond to RSI. Palatoradicular grooves are frequently found at the palatal aspects of maxillary lateral incisors (Fig 5-16), and may extend as far as the apical third of the root. It is impossible to completely remove plaque and calculus from these grooves using a conventional approach, and it may be necessary to raise a surgical flap and perform careful odontoplasty to eliminate the groove. In deeper grooves, there may be communications with the pulp system of the tooth, and in such cases odontoplasty must be undertaken with extreme care.

牙龈退缩

局部牙龈退缩可能由下列原因造成：

- 刷牙方法不当。
- 系带附着过高。
- 人为损伤。
- 饰物刺伤（图5-17）。
- 骨开裂或骨板较薄。

广泛的牙龈退缩通常发生在严重牙周病变或者牙周治疗炎症消退后。

Gingival Recession

Localised gingival recession is associated with factors such as:

- toothbrush trauma
- high frenal attachment
- habits or factitious (self-inflicted) injury
- body piercing (Fig 5-17)
- bony dehiscences, or thin alveolar bone.

Generalised gingival recession occurs in progressing periodontal disease, or following resolution of inflammation as a result of periodontal treatment.

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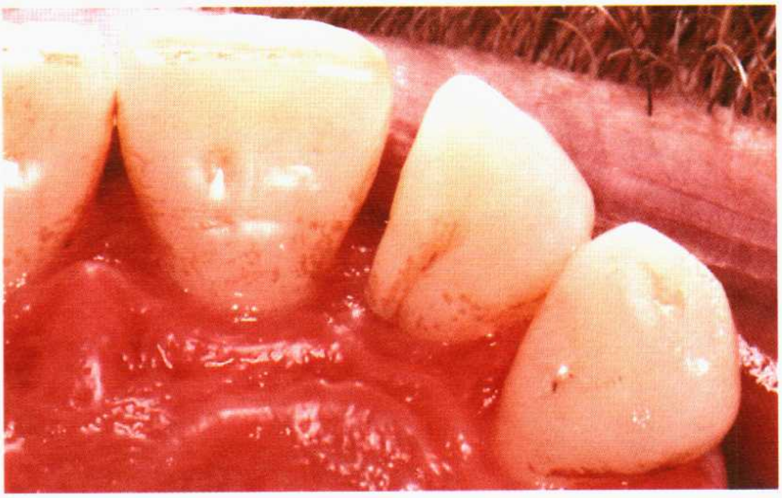


图 5-16　上颌侧切牙腭侧的凹面沟，伴有深牙周袋的形成。由于这种凹面沟常延伸至根尖，因此非手术治疗难以获得成功

Fig 5-16 Palatoradicular groove associated with deep pocketing on the palatal aspect of this upper lateral incisor. Such grooves may extend close to the apex of the tooth and are, therefore, often impossible to treat successfully by non-surgical management alone

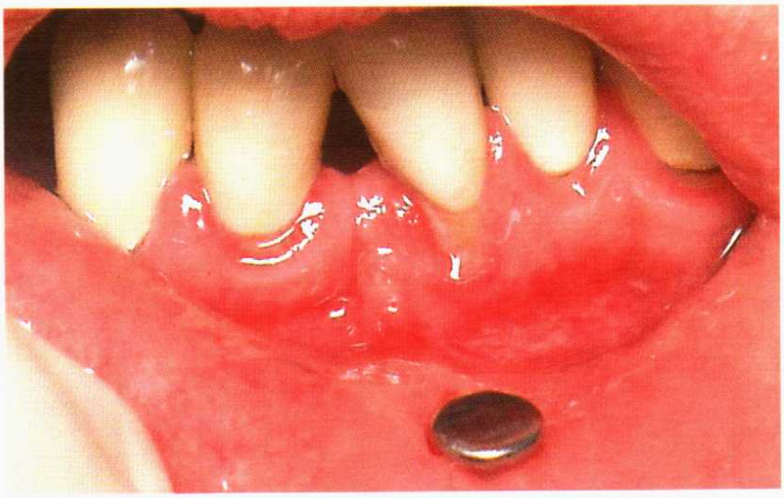


图 5-17　由唇饰钉引起的左下中切牙局部牙龈退缩

Fig 5-17 Localised gingival recession affecting the lower left central incisor associated with a lip stud

局部牙龈退缩导致角化龈宽度变小。若菌斑控制良好，角化龈缺失并不会导致牙龈退缩。局部牙龈退缩导致根面暴露、影响美观、牙齿敏感，并增加根面龋的机会。

牙龈退缩的治疗方法如下：

• 通过临床探诊测量、照相和模型

Localised gingival recession results in a reduction in the width of keratinised gingiva. It is important to remember that absence of keratinised gingiva does not inevitably lead to gingival recession, providing a high standard of plaque control is maintained. Localised gingival recession results in exposure of the root surface, which may be aesthetically unacceptable, and lead to hyper-sensitivity, and an increased risk of root caries.

Treatment options for gingival recession include:

• Recording the extent of the recession

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分析记录牙龈退缩的情况。

- 去除病因，如改正不良的刷牙方法。
- 使用单束毛刷清洁退缩区域。
- 根面平整以清除菌斑牙石。
- 如果牙龈退缩影响美观，可使用龈板覆盖暴露的牙根和牙间隙。

如果上述方法不起作用，则须采取膜龈手术增加附着龈的宽度或采取牙龈移植手术，还可联合冠向复位瓣术以覆盖退缩区域。这些手术需要牙周专业医生操作。

by clinical probing and measurement, photographs and study models.

- Eliminating aetiological factors such as a traumatic toothbrushing technique.
- The use of single-tufted brushes to clean into the recession defect.
- RSI to remove plaque and calculus.
- a gingival veneer to cover exposed roots and embrasure spaces, if aesthetics are a concern.

If these treatment options are not successful, then mucogingival surgery may be indicated to increase the width of the attached gingiva or to undertake a grafting procedure, possibly in combination with a coronal advancement flap to cover the area of recession. Referral to a specialist periodontist is likely to be required.

根分叉嵴

根分叉嵴是指横跨根分叉的牙骨质桥。除了牙齿根分叉面本身的凹度外，根分叉嵴也可使菌斑易于堆积，器械不易到达。最好使用小的金刚砂车针去除根分叉嵴，即根外形修整。

Furcation Ridges

Furcation ridges are pronounced ridges of cementum that run across the roof of a furcation. Furcation ridges, in addition to the concavities of the furcal aspects of the roots, create plaque-retentive areas that are extremely difficult to instrument. Where accessible, they can be removed using small diamond burs (odontoplasty).

牙齿解剖和牙弓关系

牙齿的外形和牙齿在牙弓中所处

Dental Anatomy and Tooth-Arch Relationships

The shape of the teeth and the location

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的位置也可使菌斑易于堆积，比如：

- 牙列拥挤，使牙齿重叠，在缺乏有效的口腔卫生指导时，增加了菌斑滞留面积（图 5-18）。
- 两牙邻接过紧，难以用牙线清洁邻面。
- 牙倾斜或移位，如由于近中邻牙的缺失，使磨牙向近中倾斜，从而增加了菌斑滞留面积。
- 临床牙冠呈球状，在外形高点线以下易形成菌斑滞留区。
- 颈部明显突出，增加了菌斑滞留面积。
- 不易清洁的拥挤的磨牙。一旦炎症产生，邻间隙牙槽骨很容易吸收。

上述情况的治疗方法还比较有限，主要是确定病因，提醒患者注意，并且

of teeth within the arch may result in plaque-retentive areas, for example:

- crowding, in which overlapping teeth create stagnation areas in the absence of effective OHI (Fig 5-18)
- tight contacts, which make interproximal cleaning with floss impossible
- tipped or drifted teeth, mesially inclined molars, for example, following loss of the mesial neighbouring tooth, resulting in plaque stagnation areas
- bulbous clinical crowns, which predispose to the accumulation of plaque below the line of maximum contour
- prominent cervical features that are plaque stagnation areas
- stacked molars restricting access for cleaning. In such situations the thin plates of interproximal bone are susceptible to rapid resorption if disease develops.

Treatment options for these various situations are very limited, and primarily in-



图 5-18　舌倾的下前牙形成菌斑滞留区导致牙龈炎症

Fig 5-18 Instanding incisors, resulting in plaque stagnation areas and resultant gingival inflammation

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长期提供口腔卫生指导以尽量控制这些区域的菌斑。

volve identifying the problem, making the patient aware of it, and providing pertinent OHI to maximise plaque control in such stagnation areas.

医源性危险因素

修复体悬突

这是由较差的修复技术，特别是修复体龈缘位置处理不当而引起。悬突的存在造成邻间隙清洁困难，而形成菌斑滞留区。这易使该部位产生炎症，并出现附着丧失和牙槽骨的破坏（图 5-19）。同时可能产生继发龋。

很显然，对于这种情况的处理，预防才是最主要的方法，但有时即使是很仔细的充填和放置成形片也难免会形成悬突。处理方法如下：

Iatrogenic Risk Factors

Overhanging Restorations

These result from poor restorative technique, in particular in relation to gingival margins. Interproximal cleaning is impossible if overhangs are present, resulting in plaque stagnation areas. This predisposes the site to plaque-induced inflammation, loss of attachment and alveolar bone destruction (Fig 5-19). Secondary caries is also likely to develop.

Clearly, prevention is the best option, although even with careful placement and contouring of matrix bands, overhangs do sometimes occur. Treatment options for overhangs include:

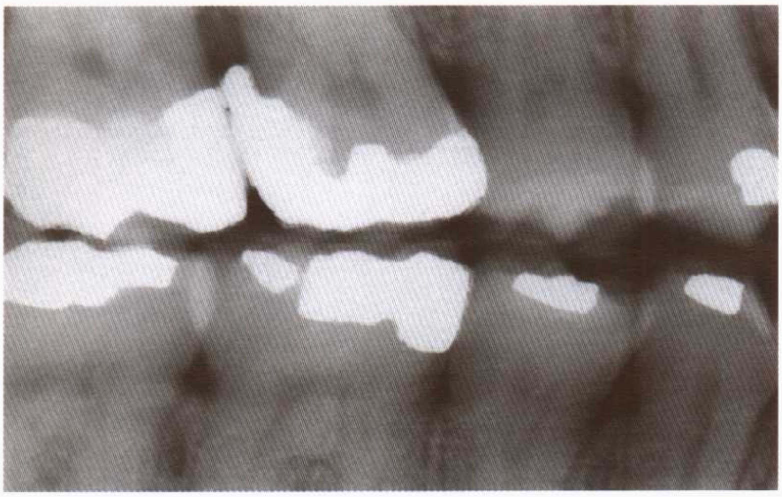


图 5-19 银汞充填体边缘悬突导致牙槽骨吸收，去除悬突可能会暴露充填不严密造成的充填体表面的多孔结构，最好的解决办法就是更换充填体

Fig 5-19 Overhanging amalgam restorations and resultant alveolar bone loss. Removal of the overhangs using burs may expose "porous", poorly condensed amalgam on the surface of the restoration. Replacement of the restoration is usually the best treatment option

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- 用细金刚砂车针去除悬突，或在回旋手机上使用有安全侧边的切削尖。
- 更换充填体。
- 去除充填体后，应进行口腔卫生指导和根面平整以去除牙石和利于菌斑控制。

- removal of the overhang (if access permits) with a fine diamond bur, or the use of a safe-sided cutting tip in a reciprocating handpiece
- replacement of the restoration
- following removal of an overhang, OHI and RSI is generally required to remove calculus and control plaque accumulation.

设计不良的局部义齿

在缺乏有效的口腔卫生措施下，局部义齿易使菌斑滞留。尤其是塑料义齿的邻面夹常会导致菌斑的堆积、牙龈退缩和牙周组织的破坏（图 5-20）。钴铬合金的义齿可直接损伤牙周组织，如果设计靠近龈缘则易引起菌斑堆积。

Poorly Designed Partial Dentures

Partial dentures encourage plaque accumulation in the absence of effective oral hygiene. In particular, interproximal collets on acrylic dentures result in plaque accumulation, gingival recession, and breakdown of periodontal tissues (Fig 5-20). Components of cobaltchrome dentures may also cause direct trauma to the periodontium and if positioned too close to the gingival margins, can encourage plaque accumulation.

可摘局部义齿引起的这些问题应

Prevention of problems with removable

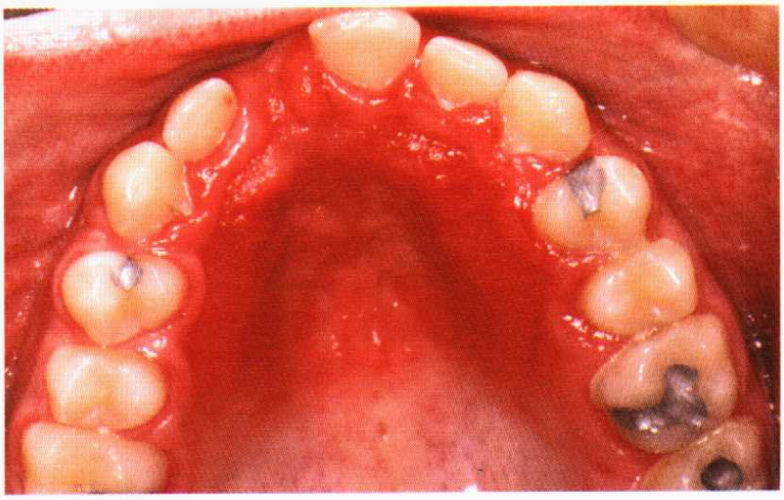


图 5-20　设计不良的局部塑料黏膜支持式义齿引起的牙龈炎症，同时可见义齿造成黏膜变白

Fig 5-20　Gingival inflammation associated with inter-proximal collets forming part of a poorly designed, acrylic, mucosa-borne partial denture. The patient also has denture-induced candidosis

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在设计时就要考虑如何预防：

- 尽量使用牙齿支持而不是黏膜支持。
- 基牙邻面避免使用塑料。
- 确保牙龈组织和局部义齿之间能够有效清洁。

设计不良的局部义齿引起的牙周炎的处理方法包括将义齿更换成设计良好的义齿、口腔卫生指导和根面平整以消除牙周炎症。告知患者晚上取下义齿并注意清洁。

partial dentures is achieved by careful design to:

- utilise tooth support rather than mucosal support, where possible
- avoid interproximal acrylic collets
- ensure adequate clearance between the gingival tissues and components of partial dentures.

Treatment of periodontal problems associated with poorly designed partial dentures involves replacing the defective denture with one that is well designed, and OHI and RSI to eliminate periodontal inflammation. Instruction to leave dentures out at night and appropriate cleaning information must also be given.

正畸矫治器

不管活动还是固定的正畸矫治器都可引起菌斑的堆积。特别是固定矫治器，对口腔卫生的保持带来很大的不便（图 5-21）。因此，不能有效控制菌斑的患者不适合使用矫治器。矫治

Orthodontic Appliances

Both fixed and removable orthodontic appliances encourage plaque accumulation. Fixed appliances, in particular, present considerable oral hygiene challenges to the patient (Fig 5-21). Clearly, orthodontic ap-

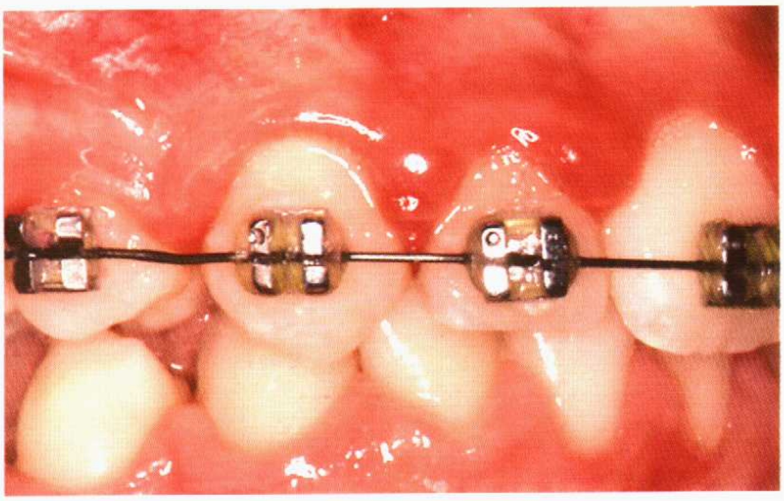


图 5-21　使用固定矫治器造成的菌斑滞留和牙龈炎症

Fig 5-21　Plaque stagnation area and gingival inflammation associated with a fixed orthodontic appliance

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器的设计也应强调简单以利于牙龈的清洁。对于患者，应加强口腔卫生指导，并指导如何使用正畸专用牙刷、单束毛刷、瓶状牙刷和牙线。

pliances should not be given to patients with sub-optimal plaque control. Appliances should also be designed to ensure adequate clearance of the gingival tissues, with an emphasis on a simple design. Patients should be given intensive OHI, with instruction in the use of orthodontic toothbrushes, single tufted brushes, bottle brushes and floss.

全冠边缘缺陷

全冠边缘缺陷可引起局部牙龈炎症，组织炎症明显，探诊易出血（图5-22）。引起冠边缘缺陷的原因主要是印模边缘的不清晰，使技工无法制作出合适的边缘与临床牙冠边缘吻合。有关缺陷的全冠边缘的处理方法极少。轻微的缺陷可用金刚砂车针修整，并抛光。否则最好重新制作。

Defective Crown Margins

Defective margins result in localised gingival inflammation. The tissues become very inflamed and readily bleed on probing (Fig 5-22). The most common reason for positive crown margins is unclear margins in impressions, making it impossible for the technician to construct a crown that conforms with the margins that have been created. Treatment options are very limited for defective crown margins. Very slight positive margins may be corrected with a fine diamond bur and careful finishing.



图 5-22　双侧上颌中切牙由于全冠边缘的缺陷而形成牙龈明显炎症

Fig 5-22　Marked gingival inflammation associated with positive crown margins at both central incisors

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假如有可能，全冠边缘最好设计在龈上，这样可避免冠－牙结合界面影响牙龈组织。如果要考虑美观，则将冠边缘置于龈缘，而不是龈下，这样有利于局部卫生的维护。试戴和粘冠时应确保冠边缘的完全就位。矛盾的是，为暂时的美观而试图将冠边缘置于龈下，常又引起美观问题，因为菌斑易于在冠边缘滞留而引起牙龈炎症。还应保持冠边缘到牙槽嵴顶 2～3mm 的最小宽度即生物学宽度。这个距离源于健康龈牙结合部的宽度，即近 1mm 的上皮附着（结合上皮）和 1～2mm的结缔组织附着宽度。如果生物学宽度因冠边缘深入龈下过多而破坏，则常会有炎症发生，牙周附着破坏，直到生物学宽度的重新恢复。

Otherwise, replacement of the crown is indicated.

Where possible, crown margins should be located supragingivally so that the gingival tissues are not affected by the crown-tooth interface. If aesthetic concerns prevent this, then crown margins placed at the gingival margin are better than subgingival crown margins as they are easier to monitor and keep clean. Attention to detail is essential when fitting and cementing crowns to ensure the best possible marginal adaptation. Paradoxically, attempts to place crown margins subgingivally for aesthetic reasons usually result in compromised aesthetics because of the development of gingival inflammation associated with plaque retention at the margins. Furthermore, a minimum distance (the "biologic width") of approximately 2-3mm must remain between the crown margin and the alveolar crest. This distance is derived from the dimensions of the dentogingival junction in health, where there is approximately lmm of epithelial attachment (the junctional epithelium) and approximately l-2mm of connective tissue attachment. If the biologic width is encroached by placing crown margins too far subgingivally, then inflammation and breakdown of periodontal attachment apparatus ensues until the biologic width is re-established.

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固定桥桥体的缺陷

桥体挤压牙龈组织，易引起菌斑堆积和炎症的发生。这个问题可通过将桥体设计成脱离龈接触（以利于刷洗）来解决。桥体外形要凸，且表面光滑。要想兼顾桥体的美观而又无菌斑沉积，桥体与牙槽嵴颊侧面应为尽可能小而轻的接触，允许超级牙线（superfloss）通过接触部位并予以清洁。桥体缺陷的处理包括特殊的清洁方法（如使用超级牙线），修改桥体形状，直至重新制作义齿。

Defective Bridge Pontics

Bridge pontics that impinge on the gingival soft tissues result in plaque accumulation and inflammation. This can be prevented by ensuring that pontics are carefully designed to be clear of the tissues and to facilitate cleaning. Pontics should be convex in all directions and have smooth surfaces. A compromise between aesthetics and the ability to keep the pontics plaque-free is usually achieved by creating minimal, light contact between the pontic and the buccal surface of the edentulous ridge, thereby allowing for self-performed cleaning with superfloss. Treatment options for defective pontics include special cleaning techniques with, for example, superfloss and, where access permits, recontouring of the pontic. However, replacement of the bridge is generally required.

临床要点

- 累及健康牙的殆创伤可引起牙齿的松动移位和牙周间隙增宽，但不会引发牙周炎。
- 累及已有牙周病患牙的殆创伤可加重牙周炎的进展。

Conclusions of Clinical Importance

- Occlusal trauma affecting periodontally healthy teeth may result in increased tooth mobility and widening of the periodontal membrane space, but does not initiate periodontitis.
- Occlusal trauma affecting periodontally diseased teeth may result in

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exacerbation of pre-existing periodontitis.

- 注意检查牙周炎患者多根牙的根分叉病变，存在有根分叉病变的牙齿可能会出现明显的临床表现，而X线表现却不明显，反之亦然。
- Vigilance should be exercised when examining patients with periodontitis in order to detect furcation involvement in multi-rooted teeth. Remember that furcations may be evident clinically, but not radiographically, and vice versa.
- 有必要进行全面的检查以确定局部危险因素和菌斑滞留区。
- Thorough examination of all patients is essential to identify local risk factors and plaque stagnation areas.
- 固定和可摘义齿和正畸矫治器都须进行精心设计，戴用时应避免牙龈组织的损伤和形成菌斑滞留区。
- Fixed and removable prostheses and orthodontic appliances must be designed and fitted with great care to avoid direct trauma to the gingival tissues and the creation of plaque retentive features.

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第6章 辅助治疗

Adjunctive Treatments

目的

本章的目的是回顾目前牙周辅助治疗中的全身及局部药物治疗。

Aim

This chapter aims to provide a contemporary review of both systemic and locally delivered medications that have been reported for use as adjunctive treatments in the management of periodontitis.

要点

阅读完本章，读者应该理解全身和局部药物辅助治疗均能有效治疗牙周炎，并熟悉药物辅助治疗的适应证。

Outcome

Having read this chapter, the reader should be aware of the systemic and locally delivered adjunctive treatments that are available for the management of periodontitis, and should be better able to make informed decisions about the application of adjunctive treatments.

定义

"辅助治疗"是对牙周病传统治疗方法的补充。可分为"全身辅助治疗"，即全身药物治疗，和"局部辅助治疗"，即将药物直接置于牙周袋内的病变部位。

Definitions

"Adjunctive treatments" are those therapeutic interventions that are used in addition to conventional periodontal therapy. They can be divided into "systemic adjuncts", which are systemic medications, and "locally delivered adjuncts", which are delivered directly into the site of periodon-

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tal disease activity, via the periodontal pocket.

牙周辅助治疗之全身药物治疗

多种全身用药物均可作为牙周辅助的药物，可分为两大类：

- 针对牙周病病因的药物（包括抗生素）。
- 调节宿主反应的药物。

Systemic Adjunctive Treatments

A variety of systemic medications have been investigated as adjunctive treatments in the management of periodontitis. Systemic medications in periodontal therapy can be divided into two main groups:

- those that are directed against periodontal pathogens (this group includes the antibiotics)
- those that modulate aspects of the host response.

抗生素的全身应用

为控制细菌感染，全身用抗生素已被广泛用于医学和牙科学领域。最好根据病灶组织的细菌培养和药敏实验的结果选用抗生素，对牙周炎患者应取龈下菌斑标本进行分析。但是，实际治疗过程中由于缺乏可靠的菌斑分析系统，故在大部分病例中，这种方法缺乏可操作性。此外，牙周炎病变区的细菌种类繁多，不同的菌种对不同的抗生素敏感，这使抗生素的运用变得十分复杂。应用抗生素治疗牙周炎的难点见框 6-1。

Systemic Antibiotics

Systemic antibiotics are used widely in medicine and dentistry in the management of bacterial infections. Ideally, the decision about which antibiotic to prescribe should be based on culture and sensitivity testing of the infecting organisms, which, in periodontitis, would necessitate analysis of a sub-gingival plaque sample. In the majority of cases, however, this is not practical because reliable and comprehensive systems for analysis of plaque bacteria are simply not available. Furthermore, periodontal infections are polymicrobial involving different bacterial species all with different sensitivities to different antibiotics, which renders decision-making with regard to prescribing antibiotics even

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more complex. Some of the problems associated with using antibiotics in periodontitis are listed in Box 6-1.

框 6-1 应用抗生素治疗牙周炎的难点

- *牙菌斑中可分离出500多种细菌，15～20种细菌与牙周炎密切相关。*
- *大多数牙周致病菌可在患者口腔中检出，也可在牙周健康者口腔中检出（尽管数量较少）。*
- *牙周炎的表现复杂多样，在同一患者口内可见从健康到重度牙周炎的表现。*
- *牙周炎是临床诊断，而不是微生物学诊断。*
- *缺乏微生物标本的培养和敏感试验的设备。*
- *使用抗生素治疗牙周炎的相关文献不多。*
- *宿主反应在牙周病的致病因素中占重要作用。*

Box 6-1 Problems with antibiotic usage in periodontitis

More than 500 bacterial species have been identified in dental plaque,of which approx-imately 15-20have been strongly associated with disease.

Most periodontal pathogens are indigenous to the oral cavity,and can be found (albeit in reduced numbers) in periodontally healthy patients.

Periodontal diseases qre markedly heterogeneous,and present as a spectrum of change from health to severe diseaes.

Periodontitis is a clinical diagnosis,not a microbiological diagnosis.

Microbiological sampling systems for culture and sensitivity are not readily available.

There are relatively few randomised studies of the use of antibiotics in periodontitis.

The host response plays a major role in the pathogenesis of periodontitis.

彻底的传统非手术疗法对大多数牙周病患者均有效。因此，需要大样本的研究证实辅助治疗的确切疗效，但此类研究还很少。

It should be remembered that thorough conventional non-surgical periodontal therapy is effective for the vast majority of periodontitis patients. Therefore, to show

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另外，还需考虑使用抗生素引起细菌耐药性的问题。细菌耐药是指细菌对临床使用的抗生素的敏感性下降直至不敏感。虽然抗生素有诸多优点，但细菌的耐药性正在成为世界性的难题。

细菌产生耐药性的主要原因有：

- 滥用抗生素。
- 误用抗生素。
- 农业和畜牧业中滥用抗生素。
- 感染未能控制。
- 免疫抑制病人的增多。

解决这些问题的方法是正确使用抗生素和严格控制感染。这就要求医务人员，病人和制药公司改变观念。通常临床医生的压力大多来自于病人，他们期望医生所开的药能快速减轻症状。但若没有应用抗生素的指征，就不应该使用抗生素，而应采用其他更恰当的替代方法。急性炎症期进行引流和处理病灶的效果比用抗生素更好。

an additive therapeutic effect when using adjunctive antibiotics would require research projects with very large numbers of subjects to detect statistically significant results. There has been a dearth of such studies in the periodontal literature.

A further problem relating to antibiotic use is that of bacterial resistance, which can be defined as "a decrease of susceptibility to an antibacterial to the extent that therapy is likely to fail when it is used clinically for a recommended indication". Worldwide, the therapeutic advantages offered by antibiotics are being threatened by the emergence of resistant bacterial strains.

This has primarily occurred because of:

- overuse of antimicrobials
- misuse of antimicrobials
- widespread use of antibiotics in agriculture and animal husbandry
- lapses in infection control
- an increase in the number of immunocompromised individuals.

The solution to this problem involves responsible antibiotic use and stringent infection-control policies. This requires changing the attitudes of health care workers, patients, and the pharmaceutical industry. There is often significant pressure exerted on clinicians by patients who expect a prescription to alleviate their symptoms. If there is no indication for antibiotics, the temptation to prescribe must

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be resisted and other more appropriate alternatives must be explored. Acute infective episodes are best managed by draining the infection and treating the source of infection rather than by prescription of antibiotics.

抗生素和牙周的特殊环境

慢性牙周炎

慢性牙周炎无需全身用药。没有任何证据显示SRI加全身药物治疗的效果比单独SRI好。这是因为与慢性牙周炎相关的微生物不明确，个体间疾病发展的速度也不相同，因而很难精确判断疾病的病程以及对治疗的反应。而且，全身用药后牙周袋内的致病菌易再定植。已证实全身用药治疗慢性牙周炎并不能提高其远期疗效，因此无须使用。

Antibiotics and Specific Periodontal Conditions

Chronic Periodontitis

Systemic antibiotics are not indicated in the management of cases of chronic periodontitis. Studies have not established with any certainty whether RSI and systemic antibiotics result in any treatment benefit compared to RSI alone. This is because the microbiota associated with chronic periodontitis is relatively poorly defined, rates of disease progression differ between individuals, and there are difficulties in accurately measuring disease progression and response to treatment. Furthermore, recolonisation of periodontal pockets with periodontal pathogens occurs rapidly following antimicrobial therapy. Given that systemic antibiotics have not been shown to enhance long-term treatment outcomes in chronic periodontitis, they cannot be indicated in this condition.

侵袭性牙周炎

1999年牙周病新分类（见《Understanding Periodontal Diseases: Assess-

Aggressive Periodontitis

Following the reclassification of periodontal diseases in 1999 (see Understand-

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ment and Diagnostic Procedure in Practice》)将青少年牙周炎和快速进展性牙周炎更名为侵袭性牙周炎。侵袭性牙周炎较少见，发病率大约为0.5%，因此门诊中很少遇到。

ing Periodontal Diseases: Assessment and Diagnostic Procedure in Practice), the conditions previously termed "juvenile periodontitis" and "rapidly progressive periodontitis" were renamed "aggressive periodontitis". It should be remembered that aggressive periodontitis is rare, affecting approximately 0.5% of the population, and therefore is rarely encountered in day-to-day dental practice.

局限型侵袭性牙周炎通常与伴放线放线杆菌（actinobacillus actinomycetemcomitans，Aa）感染有关。Aa毒力强，能快速侵入牙龈组织，侵入的Aa能抵抗根面治疗(root surface instrumentation，RSI)的作用，并能在RSI后快速再定植于根面。因此，必须全身用药来抑制这些细菌。以往，采用口服四环素250mg，4/d，连用3周的方法辅助全口RSI，有报道证实服用此药后临床效果明显。由此可见Aa对四环素很敏感。但近年来，随着四环素耐药的逐渐增多，一些学者改变了用药方法，即联合应用甲硝唑（400mg，3/d）和阿莫西林（250mg，3/d），连用7天来配合全口RSI。有研究报道治疗局限型侵袭性牙周炎时，联合应用甲硝唑和阿莫西林辅助RSI比用四环素辅助RSI的疗效好。

Localised aggressive periodontitis is frequently associated with Actinobacillus actinomycetemcomitans (Aa) infection, an organism that is particularly virulent and possesses the ability to invade the gingival soft tissues. Invasion of the tissues affords the organism a degree of protection from root surface instrumentation (RSI) and allows for rapid recolonisation of the instrumented root surface. For this reason, systemic antibiotics are useful in suppressing this organism. Historically, 250mg tetracycline four times daily for three weeks as an adjunct to full-mouth RSI has been prescribed. Good clinical improvements have been reported, as Aa has tended to be particularly sensitive to tetracycline. However, the recent development of tetracycline-resistant strains of Aa has led some researchers to switch to an antibiotic regimen of metronidazole (400mg three times daily) and amoxicillin (250mg three times daily) for seven days as an adjunct to full

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广泛型侵袭性牙周炎与Aa和牙龈卟啉单胞菌(Porphyromonas gingivalis, Pg)感染有关，Pg具有多种毒性因子，能侵入牙周组织。研究报道全身用药辅助RSI治疗广泛型侵袭性牙周炎的疗效不一。如果广泛型侵袭性牙周炎患者伴有多发性牙周脓肿，则可用甲硝唑加阿莫西林（用法同上）辅助全口RSI治疗。全口RSI最好能在短期内完成(7天内)，同时配合使用抗生素。这种方法也可用于一站式的全口治疗(见第1章)。

mouth RSI. This combined antibiotic regimen has been shown to result in better clinical outcomes than tetracycline when both were used as adjuncts to RSI in the management of localised aggressive periodontitis.

Generalised aggressive periodontitis is also associated with infection by Aa, and also Porphyromonas gingivalis (Pg), another organism that possesses multiple virulence factors and has the ability to invade periodontal tissues. Research studies have reported conflicting data on the benefits of systemic antibiotics as an adjunct to RSI in treating this condition. In patients with aggressive disease, typically presenting with multiple periodontal abscesses, a combined regimen of metronidazole and amoxicillin (as above) can be used as an adjunct to full-mouth RSI. Ideally, full-mouth RSI should be conducted within a short time period (up to seven days) to coincide with the antibiotic therapy. This concept also can be incorporated into one-stage full mouth therapy (see Chapter 1).

顽固性牙周炎

顽固性牙周炎和复发性牙周炎(见《Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice》)较难区别。传统的牙周治疗对二者无效，牙周组织仍可持续破坏。若患者已接受正规的牙周系统治疗，

Refractory Periodontitis

Refractory periodontitis and recurrent periodontitis (see Understanding Periodontal Diseases: Assessment and Diagnostic Procedure in Practice) can be difficult to distinguish. Both tend to result in continued periodontal destruction despite conven-

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并进行彻底的牙周支持治疗（见第7章）后出现顽固性牙周炎，最可能是由宿主因素所致，如吸烟、精神压力或特殊的免疫缺陷，而不是由特殊的微生物感染所致。研究显示用抗生素辅助治疗顽固性牙周炎的疗效不一。因为顽固性牙周炎的牙周微生物菌群复杂多变，而且与宿主因素密切相关，所以目前对于用抗生素辅助治疗是否有效或应该用哪种抗生素等还不十分明确。总之，是否对顽固性牙周炎患者进行全身用药现在还不明确，但是，必须强调良好的菌斑控制、重新根面治疗（以扰乱龈下菌斑生物膜）和控制各种危险因素。

tional therapy. Given that patients have received appropriate treatment and are enrolled into an adequate supportive periodontal care programme (Chapter 7), refractory periodontitis is most likely to be due to a number of host factors, such as smoking, stress or specific immune defects rather than the presence of a particular microflora. Studies investigating adjunctive antibiotics in the treatment of refractory periodontitis have provided conflicting data. There is no clear answer as to whether adjunctive antibiotics are beneficial, or which antibiotic should be used. This is because of the variable nature of the periodontal microflora amongst patients diagnosed with refractory periodontitis, together with the importance of other host factors. In summary, therefore, adjunctive systemic antibiotics cannot be justified in this group of patients. Instead, the emphasis must be on excellent plaque control, reinstrumentation to disrupt subgingival biofilms, and risk factor management.

急性牙周脓肿

多发性牙周脓肿的患者若伴有全身症状（如体温升高和蜂窝织炎）应辅以抗生素治疗。牙周脓肿的治疗目的是排脓，最好是在RSI后通过牙周袋排脓。如果能从牙周袋排脓，大多数病人就不需使用抗生素。若需使用抗生素，可用阿莫西林250mg，3/d，连服7天

Acute Periodontal Abscess

Patients who present with multiple periodontal abscesses maybe treated with adjunctive antibiotics if there is evidence of spreading systemic infection (e.g. raised temperature and cellulitis). The aim of treatment of a periodontal abscess is to achieve drainage of pus, preferably via the peri-

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辅助RSI。但是，用抗生素治疗牙周脓肿应该只针对个别患者，而不应成为一种常规。

odontal pocket following RSI. If drainage can be achieved in this way, then in the majority of cases the need for systemic antibiotics will be negated. If antibiotics are required, however, amoxicillin 250mg, three times daily for seven days should be sufficient when used as an adjunct to RSI, but the need for systemic antibiotics is the exception rather than the rule.

坏死性溃疡性龈炎和牙周炎

坏死性溃疡性龈炎（necrotising ulcerative gingivitis，NUG）起病急，与梭螺菌感染、吸烟、精神压力、营养不良或HIV感染有关，其典型症状是牙龈坏死和龈乳头变钝。患者常感到剧烈疼痛而不敢刷牙。治疗时首先用龈上超声洁治器去除大块牙石，进行化学菌斑控制（洗必泰漱口），并口服甲硝唑400mg，3/d，共7天。待急性炎症控制后，再进行彻底的RSI，去除牙面沉积物，并加强口腔卫生指导。坏死性溃疡性牙周炎（necrotising ulcerative periodontitis，NUP）的早期症状与NUG相似，但其破坏范围已扩展到牙周支持组织，可能有牙槽骨暴露，并感到剧烈疼痛。这种病人应转诊至专业诊疗中心，治疗方法应包括局部牙周治疗、全身用药、去除死骨，必要时进行牙周手术。

Necrotising Ulcerative Gingivitis and Periodontitis

Necrotising ulcerative gingivitis (NUG) is an acutely painful condition associated with fuso-spirochactal infection, smoking, stress, poor diet and possibly HIV infection, characterised by gingival sloughing and blunting of interdental papillae. The condition is so painful that the patient may not be able to brush their teeth. Therapy in the first instance should involve full mouth supragingival ultrasonic instrumentation to reduce the plaque mass, together with chemical plaque control (chlorhexidine mouth rinse) and prescription of metronidazole 400mg three times daily for seven days. Following resolution of the acute symptoms, the patient should be seen for further RSI to remove all tooth deposits together with reinforcement of oral hygiene instruction (OHI). Necrotising ulcerative periodontitis (NUP) may have a similar early presentation although the lesion ex-

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tends to affect the periodontal attachment apparatus. There may be exposure of alveolar bone, and the lesion is extremely painful. Referral to a specialist centre is appropriate, and treatment will involve local measures, systemic antibiotics, removal of necrotic bone, and possibly periodontal surgery to eliminate bony sequestrae.

全身药物治疗——总结

全身药物治疗的适应证见框 6-2。应注意全身药物治疗只是一种牙周辅助治疗。通常情况下，抗生素治疗牙周病的适应证很窄，仅适用于少见的局限型和广泛型侵袭性牙周炎，不能应用于慢性牙周炎和牙龈炎。全身药物治疗能增强RSI的除菌效果和宿主的防御系统以杀灭 RSI 后残留的龈下致病菌。全身药物治疗不应成为常规。用药前必须先用机械的方法去除菌斑生物膜，否则疗效有限。

Systemic Antibiotics – Summary

The situations in which the use of adjunctive systemic antibiotics may be appropriate are listed in Box 6-2. The key point is that in all cases the use of antibiotics must be an adjunctive therapy. In general, antibiotics are rarely indicated for the management of periodontal diseases, and they are certainly not indicated in cases of chronic periodontitis or gingivitis. The strongest evidence to support the use of systemic antibiotics in periodontal conditions comes from studies of localised aggressive periodontitis, and, to a lesser extent, generalised aggressive periodontitis, both of which are relatively rare. The objectives of systemic antibiotic therapy (when used) are to reinforce RSI for bacterial elimination and to support the host defence system by killing subgingival pathogens not affected by RSI. Empirical use of antibiotics should be avoided. The plaque biofilm must be mechanically disrupted, as without this, antimicrobials have limited

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efficacy.

框6-2 抗生素辅助治疗牙周炎的适应证

- *侵袭性牙周炎（典型特征是有多个化脓性牙周袋），用于清除组织内残存的细菌。*
- *坏死性牙周组织病变。*
- *牙周脓肿，治疗的主要目的是排脓，通常情况下单独RSI后也有效，此时一般不使用抗生素。*
- *感染扩散，并伴有发热、弥散性软组织肿胀、张口受限和吞咽困难等症状。*

Box 6-2 Possible indications for adjunctive antibiotic use in periodontics

Aggressive forms of periodontitis (typically characterised by multiple suppurating plckets)to eliminate reservoirs of bacteria in the tissues.
Necrotising periodontal conditions.
Periodontal abscess,though the primary goal is drainage of pus,which can normally be achieved by RSIalone,thereby negating the need for antibiotics.
Spreading,severe infection with associated symptoms such as pyrexia,gross diffuse swell-ing,limited mouth opening,difficulty swallowing.

宿主调节疗法

宿主调节疗法（host modulatory therapy，HMT）在牙周病治疗中是一个相对较新的概念，是随着对牙周致病菌以及宿主在牙周治疗反应中的重要性的深入了解而发展起来的。HMT 的目的是通过降低宿主反应的破坏性来提高传统牙周治疗的疗效，从而使牙周组织破坏减少，促进牙周组织恢复健康。HMT是一种辅助治疗，目的是达到牙周治疗的最好疗效。选择适合的病人是进行任何辅助治疗的关键。要想达到最好的疗效，患者必须对这种

Host Modulatory Therapy

Host modulatory therapy (HMT) is a relatively new concept in the management of periodontitis, and has been driven by improved understanding of periodontal pathogenesis and awareness of the importance of the host response in periodontal disease. The goal of HMT is to enhance traditional periodontal therapies by modifying the destructive aspects of the host response so that periodontal breakdown is reduced and the periodontium is stabilised. Host response modulators are used as ad-

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治疗产生兴趣，同时了解自己的病情，这样才能保证治疗期间患者有良好的依从性。

juncts to conventional periodontal therapy to maximise the treatment response. Careful selection of patients is key when considering any adjunctive therapy. To achieve best results, patients must be interested and well informed about their condition so that compliance is maximised.

HMT 是牙周治疗的一部分。在十几或二十年后可能出现更多调节宿主反应的新方法，特别是对高危人群，如糖尿病患者和吸烟者。调节宿主反应的全身药物可分为以下几类：

- 非甾体类抗炎药（non-steroidal anti-inflammatory drugs，NSAIDs），特别是选择性环氧化酶-2（COX-2）抑制剂（见下文）。
- 小剂量的强力霉素（SDD）。
- 二膦酸盐。

HMT represents an emerging area of periodontal therapy. It is very likely that the next ten to twenty years will witness the development of more therapies that modulate different aspects of the host response, particularly in "at-risk" groups such as diabetics or smokers. Various categories of systemic drugs have been evaluated as host response modulators. These include:

- the non-steroidal anti-inflammatory drugs (NSAIDs) (particularly selective COX-2 inhibitors (see below)
- subantimicrobial dose doxycycline (SDD)
- bisphosphonates.

不同的HMT针对牙周炎宿主反应的不同方面。牙周病的病因、目前所知的HMT靶点和局部辅助治疗的概况（见下文）如图6-1所示。

Different HMTs target different aspects of the host response in periodontitis. A schematic to represent periodontal pathogenesis is shown in Fig 6-1, together with target points for HMTs that are currently available and also local delivery adjunctive treatments (discussed below).

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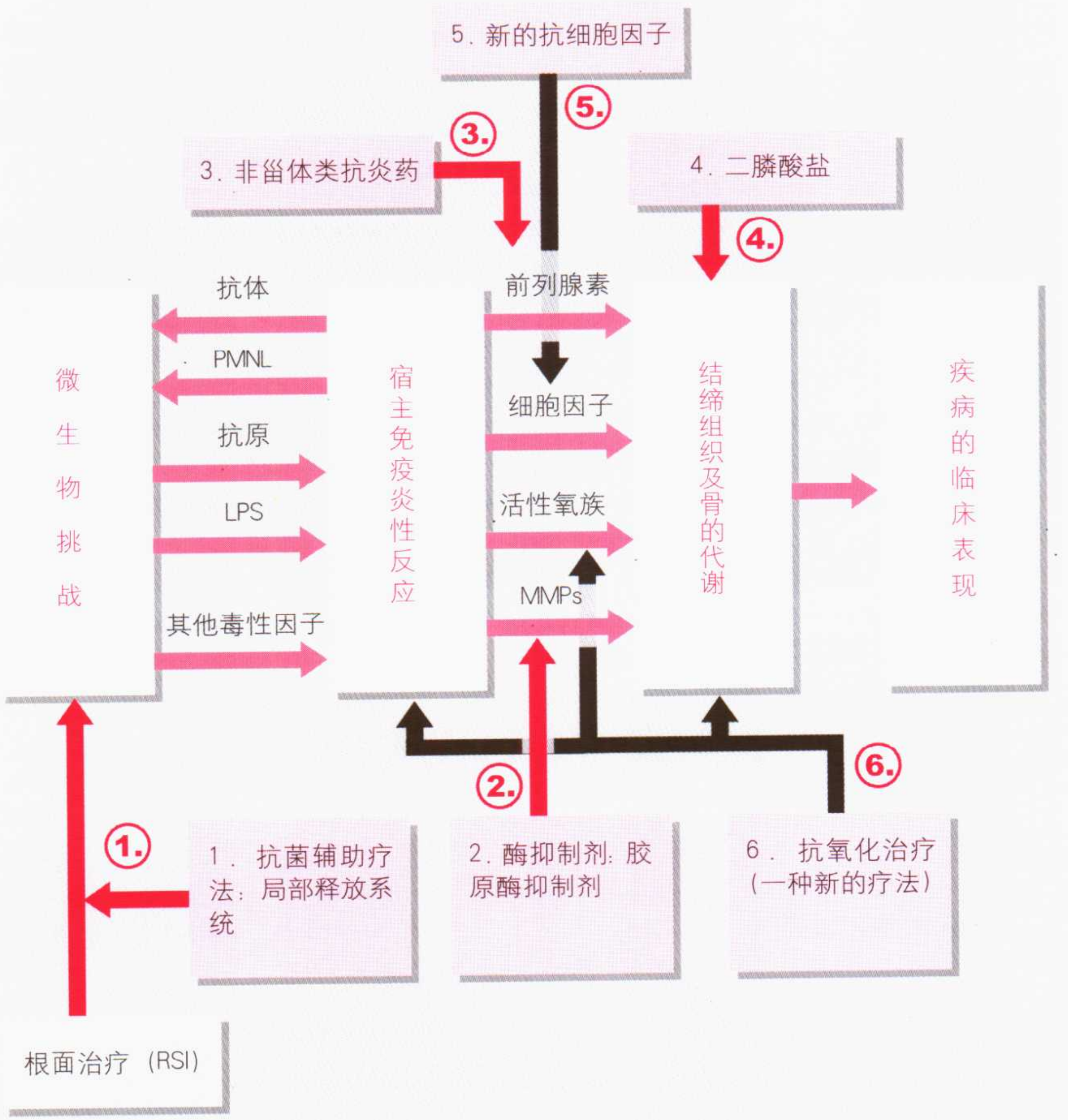


图6-1 显示牙周炎的病因和辅助治疗的靶点及潜在靶点（病因模式来自Page and Kornman 1997）。牙周病的病因在本系列丛书的第一本中曾提及。此图主要说明的是辅助治疗的潜在靶点。粉红色箭头代表药物治疗的潜在靶点（包括局部和全身用药），目的是降低疾病对组织结构的破坏。黑色箭头代表目前尚未证实的潜在疗法，将来可能成为辅助治疗的新疗法。因此，机械治疗方法RSI的目的是破坏菌斑生物膜：1）局部缓释系统进一步减少细菌定植；2）酶抑制剂（胶原酶抑制剂，弹性蛋白酶抑制剂）抑制基质金属蛋白酶（MMPs）的合成；3）NSAIDs抑制前列腺素的释放，从而抑制牙槽骨的吸收；4）二膦酸盐抑制破骨细胞活性，从而抑制牙槽骨吸收；5），6）抗氧化剂有助于保持活性氧族的平衡，用于治疗侵袭性类风湿性关节炎的新型抗细胞因子药物可调节细胞因子的活性。因此随着治疗药物的发展，将来还可能发现针对牙周病病因的其他方面新药。

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PMNL：多形核白细胞；LPS：脂多糖；MMPs：基质金属蛋白酶；ROS：活性氧簇

Fig 6-1 Schematic illustration of the pathogenesis of periodontitis and targets/ potential targets for adjunctive therapies (pathogenesis model is after Page and Korn-man 1997). The pathogenesis of periodontitis was covered the first book in this series. The potential target points for adjunctive therapies are schematically illustrated. The pink arrows represent possible target points in this pathogenesis model for drug therapies (either topical or systemic) that aim to reduce destructive components of the disease process. The black arrows represent potential therapies, which have yet to be investigated or proven, but which may also form novel adjunctive therapeutic targets. Thus, mechanical instrumentation (RSI) is undertaken to physically disrupt the plaque biofilm: 1.) Antimicrobial local delivery systems may be administered to further reduce the bacterial load. 2.) Enzyme inhibitors (collagenase inhibitors, elastase inhibitors) would inhibit the elevated production of MMPs. 3.) Non-steroidal anti-inflammatory drugs (NSAIDs) may be used to inhibit the release of prostaglandins, thereby in turn reducing alveolar bone resorption. 4.) Bisphosphonates inhibit osteoclastic activity, thereby possibly reducing bone resorption. 5.)/6.) Antioxidant preparations may help restore the balance from excess ROS-production and novel anti-cytokine drugs developed for management of aggressive rheumatoid arthritis may have a role in the future modulation of excessive cytokine activity. The future is likely to see the development of additional adjunctive treatments that target other aspects of the pathogenesis model.

PMNL - polymorphonuclear leukocytes; LPS - lipopolysaccharide; MMPs - matrix metalloprotenases; ROS - reactive oxygen species.

非甾体类抗炎药

非甾体类抗炎药（Non-steroidal anti–inflammatory drugs, NSAIDs）通过直接抑制环氧化酶（cyclo-oxygenase, COX）而抑制前列腺素合成。前列腺素是牙周炎发生发展过程中出现的主要炎性介质，可导致牙周组织炎症和牙槽骨吸收。研究显示，与安慰剂相比，每天服用NSAIDs，连服3年能显著降低牙槽骨的吸收速度。但如果将NSAIDs作为牙周炎治疗的辅助药物会引起一些严重的副作用。诚然，牙周炎患者需要服NSAIDs一段时间才有疗

Non-Steroidal Anti-Inflammatory Drugs

Non-steroidal anti-inflammatory drugs (NSAIDs) inhibit the formation of prostaglandins by direct inhibition of cyclo-oxygenase (COX). Prostaglandins are key inflammatory mediators in periodontal disease, resulting in inflammation and enhanced alveolar bone destruction. Studies have shown that NSAIDs administered daily for periods of up to three years significantly slowed the rate of alveolar bone loss compared to a placebo. However, the NSAIDs suffer from some serious disad-

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效，但这些药具有明显的副作用，如胃肠道反应，出血（因该药能影响血小板聚集，从而抑制凝血酶形成），肾脏和肝脏损伤。将来，服用选择性环氧化酶-2抑制剂则能避免这种由于长期服用NSAIDs带来的副作用，这些新药能抑制前列腺素合成，但不具有NSAIDs的副作用。因此将来应注重环氧化酶-2抑制剂在牙周辅助治疗中的研究。

vantages when considered for use as adjunctive treatments for periodontitis. Daily administration for extended periods is necessary for periodontal benefits to become apparent. The NSAIDs are associated with significant unwanted side effects, including gastrointestinal problems, haemorrhage (due to impaired platelet aggregation resulting from inhibition of thromboxane formation), and renal and hepatic impairment. For the future, the adverse effects of long-term NSAID use may be avoided by administration of a selective COX-2 inhibitor. These newer drugs inhibit prostaglandin formation, but do not suffer from the same unwanted effects as NSAIDs. Further research into the use of COX-2 inhibitors as adjuncts to periodontal treatment is warranted.

小剂量强力霉素

小剂量强力霉素（subantindcrobial dose doxycycline，SDD）为含20mg强力霉素的片剂，是由制药商推荐的用于治疗中、重度慢性牙周炎的辅助药物，2/d，连用3个月，最长可用9个月。早期的研究显示此剂量的强力霉素对口腔菌群和身体其他部位的菌群并无抗菌作用。20mg剂量的强力霉素不是作为抗生素，而是作为胶原酶抑制剂在治疗过程中发挥作用。胶原酶是基质金属蛋白酶（matrix metalloproteinases，

Subantimicrobial Dose Doxycycline

Subantimicrobial dose doxycycline (SDD) is a 20mg dose of doxycycline (Periostat®) that is recommended by the manufacturer as an adjunct to RSI in the treatment of moderate-severe chronic periodontitis. It is taken twice daily for three months, up to a maximum of nine months of continuous dosing. Early research data claims that at this dose of doxycycline has no detectable antimicrobial efficacy on the oral flora or the bacterial flora in other re-

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MMPs）的一种，牙周炎患者中其含量增高，并严重破坏牙周组织。早期由药商赞助的研究显示此药对一些患者的深牙周袋有效，但还需更多的独立性研究来证实此种药物对哪种类型的牙周炎患者（如糖尿病患者）有效。SDD的辅助作用是建立在高质量的RSI的基础上，绝不能因使用了SDD而忽略了后者。

gions of the body. A 20mg dose appears to exert its therapeutic effect not as an antibiotic, but as a collagenase inhibitor. Collagenases are members of a key group of enzymes known as matrix metallo-proteinases (MMPs) that are produced in elevated quantities in patients with periodontitis, and are responsible for a significant proportion of the breakdown of periodontal structures. Early studies, sponsored by the manufacturer, show some benefits for deeper sites in some patients, but further independent studies are needed to identify which patient groups (e.g. diabetics) may benefit more substantially from such adjunctive therapy. RSI must be performed to the very highest standard to achieve the benefits of adjunctive SDD, and the use of adjunctive SDD does not remove this responsibility from the practitioner.

二膦酸盐

二膦酸盐是骨保护因子，能抑制破骨细胞活性而减少骨吸收。其详细的作用机制不明，但研究显示二膦酸盐能干扰破骨细胞新陈代谢和溶酶体酶的分泌。由于二膦酸盐具有调节破骨细胞活性的潜能，因此它可用于牙周病的治疗。现在对二膦酸盐的研究还处在早期阶段，但动物试验证实阿伦膦酸盐能显著抑制牙周炎的骨吸收。某些二膦酸盐具有副作用，如抑制骨矿化和改变白细胞数量。新一代二膦

Bisphosphonates

The bisphosphonates are bone-seeking agents that inhibit bone resorption by disrupting osteoclast activity. Their precise mechanism of action is unclear, but research has shown that bisphosphonates interfere with osteoclast metabolism and secretion of lysosomal enzymes. The ability of bisphosphonates to modulate osteoclast activity clearly has potential to be useful in the treatment of periodontitis. Research in this subject is at an early stage, but animal

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酸盐的毒性降低但疗效加强。今后应对二膦酸盐作为牙周炎辅助治疗药物的可行性进行更深入的研究，这是目前研究的新领域。

studies have shown that the bisphosphonate alendronate significantly reduces bone resorption in periodontitis. Some bisphosphonates suffer from unwanted effects, such as inhibition of bone calcification and changes in white blood cell counts. Newer generations of these compounds appear to be less toxic and more efficacious. Future research will continue to address the potential utility of bisphosphonates as adjunctive treatments for periodontitis, and this is an emerging area of investigation.

牙周辅助治疗之局部药物治疗

局部释放药物可作为RSI的辅助用药。局部释放系统是一种能将其内含的抗生素释放到牙周袋内的装置，它有以下优点：

- 能将药物直接送到病变区。
- 保证病变区有足够的药物浓度，减少牙周致病菌。
- 维持病变区的药物治疗浓度，不需高剂量的全身用药。
- 对患者依从性的要求较低。

Local delivery adjunctive treatments

Local delivery devices can be used as adjuncts to RSI. Local delivery systems that have been developed to date contain antibiotics and other antimicrobial drugs in a vehicle that is delivered into the periodontal pocket. The potential advantages of local delivery systems include:

- the drug is delivered directly to the site of disease activity
- there is adequate drug concentration at the site of disease, achieving therapeutic concentrations to reduce the levels of pathogenic bacteria
- therapeutic drug levels are maintained over time at the site, without high systemic exposure to the drug
- the therapy is less dependent on patient compliance.

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运用局部释放系统的目的是局部给药后能长时间维持病变部位药物的有效治疗浓度。但渗出的龈沟液(gingival crevicular fluid，GCF)可能会影响牙周袋内药物浓度的维持。为了解决这一问题，可将易被GCF冲出的低粘性药物改制成能固定在牙周袋内的半固体片剂或凝胶。

理想的局部释放系统应具有以下特点：

- 有效性。
- 易于操作。
- 能长时间维持药物的有效治疗浓度。
- 能充分填充于牙周袋内。
- 无毒，无刺激性。
- 经济实惠。

而且，一旦药效结束，此系统能被吸收或被排出，而无需取出。

局部释放系统可分为：

The aim when using local delivery systems is to deliver and maintain effective concentrations of a chemotherapeutic agent at the site of disease for a prolonged period of time. The ability of the agent to remain in the periodontal pocket may be hampered by the outward flow of gingival crevicular fluid (GCF). In an attempt to overcome this problem, there has been a trend in the development of these agents to move away from low-viscosity gel products, which may be washed out by GCF, to products which are inserted as semi-solid chips or as gels that solidify within the periodontal pocket.

An ideal local delivery product would:

- be efficacious
- easy to use
- contain a drug reservoir of sufficient volume to maintain therapeutic drug levels over time
- fill the periodontal pocket in three dimensions
- remain dimensionally stable
- be non-toxic/non-irritant
- have no drug interactions or side effects
- cost effective.

Furthermore, local delivery products should be resorbable once their period of maximal efficacy has come to an end, eliminating the need to be removed.

Local delivery systems can be broadly classified as:

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- 缓释系统，24小时内能持续释放药物。
- 控释系统，能持续释放药物达24小时以上。现有5种系统，见表6-1。

- sustained release devices, which are designed to provide drug delivery for <24 hours
- controlled delivery systems, which have a duration of drug release of > 24 hours. There are five systems that have been developed to date, and these systems are summarised in Table 6-1.

四环素纤维

四环素纤维(Actisite®)由含25%四环素的醋酸乙烯(ethylene vinyl acetate，EVA)纤维组成，易于弯曲，长约23cm，直径约0.5mm。使用时可用塑料工具将其塞入牙周袋内，呈反复折叠状直至塞满牙周袋，也可根据需要将其剪成易于安放的小段，然后用

Tetracycline Fibres

The tetracycline fibre system comprises ethylene vinyl acetate (EVA) fibres containing 25% tetracycline (Actisite®). The fibre is flexible and is approximately 23cm long with a diameter of 0.5mm. The fibre is packed into the pocket with a plastic instrument so that the fibre is folded back on it-

表6-1 局部释放系统的比较

Table 6-1 Comparison of local delivery systems

系 统	成 分	商 品 名	可吸收性(时间)	装置类型
四环素纤维	EAV纤维中含25%四环素	Actisite®	否	控释
米诺环素凝胶	液体凝胶中含2%米诺环素	Dentomycin®	是 (1d)	缓释
甲硝唑凝胶	液体基质中含25%甲硝唑	Elyzol®	是 (1～3d)	缓释
氯己定片	水解凝胶基质中含2.5mg氯己定	PerioChip®	是 (8d)	控释
强力霉素聚合物	可流动聚合物装置中含10%强力霉素	Atridox®	是 (7～10d)	控释

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氰基丙烯酸酯封闭牙周袋口。固定于袋内的四环素纤维可持续释放四环素7～14d，然后用刮匙将其取出，这时通常可见根面和龈壁间有空隙存在，此为原先药物占据的地方，若有残留牙石，应及时去除。

与口服四环素（2～8μg/ml）相比，四环素纤维具有更高的局部药物浓度（1 590μg/ml），和极低的血药浓度（0.4μg/ml），即四环素纤维的局部药物浓度是口服四环素的150倍以上，此浓度能杀灭牙周袋内的病菌。此外，因为血药浓度低，副作用也小。

临床研究证实，作为RSI的辅助治疗药物，四环素纤维能显著改善探诊深度、附着水平和探诊出血。还有研究报道四环素纤维能抑制龈下菌群。但

self many times to fill the pocket. The fibre can be cut into shorter lengths to facilitate placement, if necessary. The fibre must then be secured within the pocket by sealing the pocket orifice with cyanoacrylate adhesive. The fibre then releases tetracycline at a constant rate into the pocket for 7-14 days. After this time, the fibre must be removed, which is achieved by the use of a curette. When the fibre is removed, is it usually possible to see the root surface as there is a space between the tooth and the gingival wall that was previously occupied by the fibre. Any residual calculus should also be removed at this time.

Tetracycline fibres achieve very high local tetracycline concentrations (1590 μg/ml, compared to 2-8 μg/ml if systemic tetracycline is administered), with very low serum tetracycline concentrations (0.4 μg/ml compared to 2-8 μg/ml with systemic tetracycline). In other words, the local concentration of tetracycline is more than 150 times that achieved by systemic tetracycline, and this provides a bactericidal dose of the drug in the pocket. Furthermore, because the serum concentration is much less than that achieved by systemic tetracycline, fewer side effects are reported.

Clinical studies have shown that tetracycline fibres result in significantly better improvements in probing depths, attachment levels and bleeding on probing when

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也有研究报道四环素纤维的远期疗效并不好，特别是用于治疗Ⅱ度根分叉病变时。

used as an adjunct to RSI. A suppression of the subgingival microflora has also been reported following the use of tetracycline fibres. However, other studies have failed to demonstrate a long-term benefit, particularly when tetracycline fibres were used as adjuncts in the treatment of class II furcation defects.

四环素纤维具有以下缺点：

- 用氰基丙烯酸酯封闭牙周袋口可能会引起局部牙周脓肿。
- 插入纤维需要一定的技巧（虽然熟练后很容易）。
- 纤维必须被取出。

Tetracycline fibres suffer from some disadvantages:

- the use of cyanoacrylate to seal the fibre into the pocket may potentially result in the development of a localised periodontal abscess
- the fibre is technically challenging to insert, although with experience it becomes easier
- the fibre must be removed.

米诺环素凝胶

米诺环素凝胶（Dentomycin®）是一种生物可吸收性缓释系统，其甘油基质中含有2%米诺环素，可用注射器或钝头套管送入牙周袋内。米诺环素是一种抑菌性抗生素。对此药的临床研究相对较少。曾有研究报道将米诺环素凝胶作为RSI的辅助治疗药物，每周1次，连续使用4周，与单独RSI相比，能显著减少牙周袋深度（但附着水平和探诊出血的指标并无显著性差异）。在一项用米诺环素凝胶辅助RSI与单独RSI、凝胶系统的纵向比较研究中发现，米诺环素凝胶对牙周袋大于5mm

Minocycline Gel

Minocycline gel is a bioabsorbable sustained delivery system that contains 2% minocycline in a glycerine matrix (Dentomycin®). It is delivered into the periodontal pocket using a syringe and a blunt cannula. Minocycline is a bacteriostatic antibiotic. A relatively small number of clinical studies have been reported using this system. In one study, when minocycline gel was applied four times at weekly intervals in conjunction with RSI, there were significantly better reductions in probing depths compared to RSI alone (although

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的牙周炎并无辅助治疗作用。也有研究报道米诺环素凝胶对种植体周围炎有治疗作用，但缺乏对照组的研究。米诺环素凝胶的缺点是需多次上药，这是因为凝胶具有流动性，易被龈沟液冲出。总之，在临床应用中，米诺环素凝胶看来对RSI并无显著的辅助作用。

no significant .differences were observed in attachment levels or bleeding on probing). A longer-term study, in which RSI and minocycline gel was compared to RSI and gel vehicle only, found that there was no benefit when using adjunctive minocycline gel in pockets >5mm. There are also reports of benefit when using the gel for implant decontamination, but no controlled studies are available to substantiate this. A disadvantage with the minocycline gel system is that the gel is relatively fluid, and tends to be washed from the pocket by GCF flow, therefore necessitating multiple applications. In summary, minocycline gel does not appear to confer clinically significant benefit to patients when used as an adjunct to RSI.

甲硝唑凝胶

甲硝唑凝胶(Elyzol®)也是一种生物可吸收性缓释系统，其油脂基质内含25%甲硝唑。使用时可用钝头套管的注射器注入牙周袋内，与米诺环素凝胶相似，需要多次上药。厂商推荐使用两次，间隔7d，每支注射器可用20颗牙。当甲硝唑凝胶被注射入牙周袋后，凝胶可液化充满牙周袋，然后变硬，并逐渐释放甲硝唑，持续24～36h。药物注入袋内后，龈沟液中甲硝唑浓度呈指数下降，而甲硝唑的血药浓度在2～8h后达到高峰，这可能是因为药物被龈沟液冲出并被吞咽所致。大约

Metronidazole Gel

Metronidazole gel is a bioabsorbable sustained release device that contains 25% metronidazole in a lipid matrix (Elyzol®). It is applied subgingivally using an applicator comprising a syringe and a blunt cannula, and similar to minocycline gel, it requires several applications. The manufacturers recommend two applications, seven days apart, with each applicator containing sufficient gel for approximately twenty teeth. When the gel is applied into the pocket, it liquefies and flows throughout the pocket, and then undergoes a transfor-

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3d后，此凝胶被吸收。

mation into a solid phase, which gradually releases metronidazole for approximately 24-36 hours. The concentration of metronidazole in GCF falls exponentially following placement of the drug, and peak plasma concentrations are observed 2-8 hours after application, indicating that some of the drug may be swallowed following loss from the pocket as a result of GCF outflow. After approximately three days, the product bioabsorbs.

有研究报道用甲硝唑凝胶作为单一疗法治疗牙周炎取得的临床效果与RSI相似。另有研究报道，与单独RSI相比，用甲硝唑凝胶辅助RSI的治疗效果更显著。微生物学研究发现甲硝唑凝胶对牙周袋内的厌氧菌疗效不佳。这主要是因为菌斑是以生物膜的形式存在，除非用机械方法破坏，否则它能抵抗局部的药物作用。

Several studies have reported that metronidazole gel used as a monotherapy results in similar clinical improvements to those achieved by RSI. Other studies have compared metronidazole gel and RSI to RSI alone and have identified statistically significant benefits when using metronidazole gel as an adjunct. Microbiological studies have found that the gel has marginal effects on anaerobic bacteria in the periodontal pocket. This is primarily due to the fact that bacterial plaque exists as a biofilm, which, unless mechanically disrupted, is resistant to topically applied antimicrobials.

氯己定片

氯己定片(Periochip®)是一种生物可降解薄片，呈凝胶状，可水解，内含2.5mg氯己定。薄片厚0.35mm，宽4mm，长5mm(因此不适用于小于5mm的牙周袋)。薄片一端弯曲，可插到牙周袋底。上药处需隔湿干燥，用镊子从

Chlorhexidine Chip

The chlorhexidine chip is a biodegradable film of hydrolysed gelatin containing 2.5mg chlorhexidine (PerioChip®). The chip is approximately 0.35mm thick, 4mm wide and 5mm long (and therefore cannot be used in pockets <5mm deep). One end

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包装盒中取出药片插入牙周袋，然后用平头塑料棒将药片插到袋底。使用时应注意保持术区干燥，因药片遇湿会变硬而弯曲，导致难以送入袋内。送入牙周袋后，药片可固定在内，并持续释放氯己定达 7d 以上，浓度为 0.125 μg/ml，能抑制99%的龈卜微生物。它不会使牙着色和改变味觉。

of the chip is curved, and should be placed in an apical direction in the pocket. The site to be treated is isolated and dried. The chip is removed from its packaging using tweezers and pushed into the depth of the pocket. A flat plastic instrument can be used to push the chip fully to the base of the pocket. It is important to keep the area dry during chip placement, as contact with moisture renders the chip sticky and flexible, which may make it difficult to place the chip into the pocket. The chip is self-retentive and delivers chlorhexidine to the site at a concentration of 0.125 μg/ml for at least seven days, a concentration that has been shown to inhibit 99% of the subgingival microflora. The chip is not associated with staining of teeth or alterations in taste sensation.

研究显示，与单独RSI相比，用氯己定辅助RSI，能显著减少探诊深度和增加附着水平。与单独RSI相比，用氯己定辅助者，有两倍以上的位点探诊深度减少超过 2mm。用药后，患者必须用牙刷仔细刷牙，用药区不能用牙线，因为牙线可能会将药物带出。药片 7～10d 后降解并排出。研究显示，对于大于 5mm 的牙周袋，每 3 个月用药一次可取得最佳疗效。但必须在治疗前告知患者这种方法的费用较高。

Studies have shown that when the chlorhexidine chip is used as an adjunct to RSI, statistically significantly better probing depth reductions and attachment gains were achieved compared to RSI alone. In studies, over twice as many sites treated by the chlorhexidine chip and RSI underwent >2mm probing depth reductions compared to sites that were treated by RSI alone. Following placement of the chip, the patient should be instructed to brush the area carefully but not floss, due to the risk of dislodging the chip. The chip biodegrades after about 7-10 days, eliminating the need

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to be removed. Research studies have shown that the placement of a chip in pockets >5mm in depth every three months provides the most effective treatment strategy. However, such a protocol has significant cost implications for the patient, which should be discussed at the outset of treatment.

强力霉素聚合物

强力霉素聚合物(Atridox®)有两种成分：强力霉素（有效活性成分）和释放系统（一种可流动的生物可吸收凝胶控释系统）。使用前在牙椅旁将两管注射器的内容物混合，然后用其中一只钝头注射器吸取混合物注入牙周袋内。注射器的钝头必须插入袋底，然后边注射边退回，直至药物充满牙周袋。该药物具有流动性，能充满整个牙周袋，然后抽出注射器，用钝头器械将逐渐硬化的凝胶压入袋内。凝胶状的药物遇湿后逐渐硬化成蜡状物，可固定于袋内约10d，释放出高浓度的强力霉素7～10d。

Doxycycline Polymer

Doxycycline polymer (Atridox®) is supplied as two components: the active ingredient, doxycycline, and the delivery vehicle, a flowable, controlled-release, bioabsorbable polymer gel. The two syringe contained components must be mixed at the chairside. The mixed product is then placed into one of the syringes, a blunt cannula is attached, and the product is applied into the pocket. The cannula should be introduced to the base of the pocket and then gradually withdrawn as the pocket is filled. As the product is applied into the pocket, it flows to fill and conform to the pocket morphology. Once the pocket is full, the cannula is withdrawn, and the hardening gel can be packed into the pocket with a blunt-ended instrument. Contact with moisture in the pocket causes the gel to solidify to a wax-like substance that is then retained in the pocket for approximately 10 days. Doxycycline is released in high concentrations for 7-10 days.

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早期的临床研究显示，9个月后，单独使用强力霉素聚合物和RSI对减少探诊深度和附着获得的效果相当。进一步研究显示，与单独RSI相比，用强力霉素聚合物辅助RSI能显著减少探诊深度。还有研究证实强力霉素聚合物能显著抑制牙周袋内的厌氧菌，尽管治疗后细菌可再定植，6个月后，细菌总数仍在基线的60%以下。

Initial clinical studies compared doxycycline polymer to RSI, and found that the doxycycline was as effective as RSI in reducing probing depths and promoting attachment gain over nine months. Further studies have investigated the use of doxycycline polymer as an adjunct to RSI, and identified that significantly better probing depth reductions were achieved by RSI and doxycycline polymer compared to RSI alone. Studies have also demonstrated that doxycycline polymer significantly suppresses anaerobic bacteria in periodontal pockets and, whilst recolonisation does occur following treatment, after six months, total bacterial counts were still more than 60% below baseline levels.

应如何选用不同的局部释放系统？

因为治疗方法和疗程的不同，对不同局部释放系统的研究资料难以比较。目前对不同局部释放系统进行相互比较的研究较少。有一项研究对47名分别接受强力霉素聚合物辅助RSI，氯己定薄片辅助RSI和甲硝唑凝胶辅助RSI治疗的患者进行临床和微生物学方面的比较，发现强力霉素聚合物的辅助治疗效果最好，获得新附着量及位点数显著高于其他两组。以上方法在治疗后均能迅速减少牙周袋内的细菌数量，但在18周时各组间的细菌数量并无显著性差异。运用Meta分析，从

Which local delivery product to use, and when?

Interpretation of data from studies of different products is often difficult because of different treatment protocols and different study durations. There have been relatively few studies directly comparing one local delivery system against another. One study compared clinical and microbiological profiles in 47 patients who received RSI and either adjunctive doxycycline polymer, chlorhexidine chip or metronidazole gel. The doxycycline polymer performed the best, with significantly better mean attachment gains than the other two products, and

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有关用局部释放药物作为辅助治疗的比较性研究中发现，这些药物确实能提高治疗效果。

more sites demonstrating attachment gains. All treatments resulted in decreased numbers of periodontal bacteria immediately post-treatment, but at 18 weeks there were no statistically significant differences in microbiological profiles between the groups. In a meta-analysis of studies that investigated adjunctive use of locally delivered antimicrobials by combining data from several comparable studies in order to evaluate outcomes, local delivery antibiotics were found to enhance the treatment outcome.

当决定是否使用局部释放系统时，应注意高质量的RSI对大多数患者是有效的，特别对轻或中度慢性牙周炎患者。因此治疗的第一步必须是非手术疗法，包括高质量的RSI。那些对基础治疗或支持治疗阶段多次RSI而反应不佳的位点可采用局部释放系统进行辅助治疗。当决定使用局部释放系统时，应考虑以下因素：

When deciding whether or not to use a local delivery system, it must be remembered that RSI, when performed to a high standard, is an efficacious treatment in a majority of patients, particularly in cases of mild to moderate chronic periodontitis. Typically, therefore, the first line of treatment will be comprehensive non-surgical management, involving high-quality RSI. For those sites that fail to respond to initial therapy, repeated RSI performed during the supportive phase of periodontal therapy may be enhanced by the use of a local delivery system. When deciding whether to use a local delivery system, there are several factors that must be considered:

- 性价比：根据药物的价格、需要治疗的位点和可能的效果考虑。

- cost–effectiveness, in terms of the cost of the product, the number of sites that can be treated with the product, and the likely benefit of us-

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• 患者因素：如对牙周治疗的依从性和口腔卫生维护的效果。

• 医疗因素：如是否对药物过敏。

非手术疗法对依从性高，口腔卫生维护好的患者的大多数位点均有疗效。对于局部一些仍然大于5mm的深袋，应考虑重新进行RSI以破坏再定植的龈下菌斑，同时可考虑应用局部释放系统。反之，对牙周治疗依从性差，口腔卫生维护差的患者，药物辅助治疗效果可能也不佳。

当决定应用局部释放系统时，最好选择能较长时间维持牙周袋药物治疗浓度的控释系统，而不选择只能维持几个小时疗效的缓释系统。其次要考虑需要治疗的位点数目。因氯己定薄片只能治疗一个位点，如果只有一到两个位点需要局部用药，用氯己定薄片的性价比可能最高。如果有多个位点需要用药，凝胶状药物比较经济，如强力霉素聚合物。使用局部释放药物的适应证如框6-3所示。

ing the product

• patient factors, such as compliance with periodontal therapy and oral hygiene regimens

• medical factors, such as allergy or hypersensitivity to components of the product.

In a well-motivated patient who is able to maintain a good level of oral hygiene, the majority of sites are likely to respond well to non-surgical treatment. When some isolated deeper pockets (>5mm) remain, the decision may be taken to re-instrument those sites to disrupt reforming subgingival plaque, and an adjunctive local delivery device may be used. Conversely, in those patients who are not complying with periodontal treatment protocols and who have poor plaque control, the use of adjuncts is unlikely to be of benefit.

Having made a decision to use a local delivery system, it would seem appropriate to choose a controlled release device that achieves therapeutic concentrations in the pocket over a prolonged period of time, as opposed to a sustained release device that provides drug delivery for only a few hours. The next consideration is the number of sites that need treating. The chlorhexidine chip will only treat one site, and therefore is likely to be the most cost effective option if only one or two sites require the placement of a local adjunct. If there are

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multiple sites that may benefit from adjunctive therapy, then one of the gel formulations, such as the doxycycline polymer, is likely to be more cost effective. Situations in which the dentist may consider the use of a local delivery system are listed in Box 6-3.

框6-3 适合局部释放系统作为辅助治疗的临床病例

- *牙周支持治疗期复发的若干个牙周袋。*
- *非手术治疗无效的位点。*
- *种植体周围炎。*
- *局部牙周脓肿。*

Box 6-3 Suggested clinical situations in which adjunctive use of local delivery systems may be considered

Localised recurrent pockets in a patient in supportive phase of periodontal care.
Non-responding sites following non-surgical periodontal therapy.
Peri-implantitis.
Localised suppurating pockets.

局部用药与不良反应

局部用药的血药浓度低，副作用小，而且局部有效治疗药物浓度高。但选择局部用药同样要慎重，不能应用于对局部释放系统成分过敏的患者。而且，局部用药也可能引起细菌耐药，尽管这方面的研究不多。已有的研究资料显示在局部用药治疗3～6个月后，残留的耐药菌株能迅速增殖至基线水平。而其他副作用，如局部疼痛，牙过敏，继发性脓肿或味觉改变，局部用药时可将其降至最低。

Adverse reactions and local drug delivery

The advantage of local delivery is that systemic exposure to the drug is low, thereby reducing the likelihood of adverse events, whereas local concentrations are high, achieving therapeutic levels at the site of disease. However, the decision to use a local drug delivery system requires the same prudence and care of selection as the use of a systemic drug. Local delivery systems should not be used in patients with a known history of hypersensitivity or allergy

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to components of the delivery system. Furthermore, there is the potential for development of antibiotic resistance associated with the use of locally delivered antibiotics, although few studies have addressed this issue. Data available suggest that any increase in the proportions of resistant strains immediately after local delivery returns to baseline levels within approximately three to six months. Other unwanted effects such as pain on placement, tooth sensitivity, development of abscesses, or taste alterations all appear to be minimal after local drug delivery.

局部释放系统应作为单一疗法还是辅助疗法？

曾有研究对以上某些药物作为单一疗法与单独RSI进行了临床效果的比较，结果显示作为单一疗法取得的疗效不如单独RSI，而单独RSI取得的疗效是评价牙周治疗疗效的金标准。因为局部用药不能破坏菌斑生物膜，也不能去除牙石，故作为单一疗法可能无效。

因此，局部用药必须作为RSI的辅助治疗手段。牙菌斑以生物膜的形式

Monotherapy or adjunctive use of local delivery systems?

Some of the products detailed above have been studied for usc as stand-alone monotherapies and have been compared to RSI alone in clinical trials. In those studies in which the local delivery system was used as a monotherapy, the clinical benefits achieved were no greater than those achieved with RSI, which is the current "gold standard" of care for the treatment of periodontitis. Using a local delivery system as a monotherapy is likely to be ineffective because of the inability of the therapy to disrupt the plaque biofilm, and the failure to remove calculus.

Therefore, it is essential that locally delivered treatments are used as adjuncts to

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存在，能保护牙菌斑深层的一些细菌，使这些细菌对抗生素具有抵抗力。因此，在治疗牙周炎时，无论是在牙周基础治疗阶段还是牙周支持治疗阶段，都必须用机械方法RSI去除生物膜。如果能用RSI定期去除龈下菌斑，就能提高牙周治疗的疗效。局部用药的要点见框6-4。

RSI. Dental plaque exists as a biofilm, which serves to protect individual bacteria within the plaque mass, and therefore such bacteria become relatively resistant to killing by antimicrobial agents. For this reason, the biofilm must be mechanically disrupted by RSI during periodontal therapy. This is true for both initial periodontal therapy, and long-term periodontal supportive care. If subgingival plaque is regularly disrupted by RSI, then conditions favourable for periodontal healing are promoted. Key points when considering the use of adjunctive local delivery systems are shown in Box 6-4.

临床要点

- 传统的牙周疗法对大多数牙周炎患者有效。
- 辅助治疗应如其名，仅作为RSI的辅助治疗方法。
- 牙周炎患者很少需全身用药，特别是慢性牙周炎和牙龈炎患者。
- 全身药物治疗仅作为RSI的辅助疗法。
- 全身药物治疗可应用于侵袭性牙周炎，坏死性牙周炎和牙周脓肿。

Key points of clinical importance

- Conventional periodontal treatment is effective in most cases of periodontitis, providing it is thoroughly performed.
- Adjunctive treatments must be used in the manner suggested by their name — as adjuncts to RSI.
- Systemic antibiotics are rarely indicated in periodontics, and are not indicated in the treatment of chronic periodontitis or gingivitis.
- If systemic antibiotics are used, they should be used as adjuncts to conventional periodontal treatment.
- The possible indications for adjunctive systemic antibiotics are aggressive forms of periodontitis, necro-

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框 6-4 局部释放系统的应用要点

- 必须作为RSI的辅助治疗。
- 不能因为使用药物而降低RSI的质量。
- 药物治疗不能取代患者的自我口腔卫生维护和临床医生的口腔卫生指导。
- 对于主动性强，口腔卫生维护好的患者，其口腔中那些对基础治疗反应不佳的局部位点，用局部释放系统效果最好。
- 若RSI的疗效好，就不应常规局部用药。

- 宿主调节疗法目前还在发展中，它能调节宿主对菌斑微生物的异常反应。将来，与传统的抗生素治疗方法相比，牙周炎治疗的新方法可能更多地朝这方向发展。

Box 6-4 Key points when considering the use of local delivery systems

The therapy must be used as an adjunct to root surface instrumentation.
The use of a local delivery adjunce dose not lessen the requirement for thorough root surface instrumentation to be performed to the highest standard.
The local delivery adjunct must not be substituted for meticulous oral hygiene by the patient and thorough oral hygiene instruction by the clinician.
The greatest potential for successful outcomes with local delivery systems may be to enhance therapy at localised, persistent sites that failed to respond to initial therapy in well-motivated patients with good oral hygiene.
Locally delivered antimicrobials are not indicated routinely where efficacious results can be achieved by high quality, thorough root surface instrumentation.

tising periodontal conditions and periodontal abscesses.

- Host modulatory therapies are currently being developed and evaluated with a view to correcting defined abnormalities in the host response to microbial plaque. Future, novel therapies are likely to be developed in this

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area, rather than the more traditional antimicrobial arena, for the treatment of periodontal diseases.

- 局部释放系统特别适用于主动性强、口腔卫生维护良好的患者；其大多数位点进行RSI后疗效好，但少数位点仍有深牙周袋。

- Local delivery adjunctive treatments are best confined to those situations in which a well-motivated patient with good oral hygiene has demonstrated a good response to RSI in a majority of sites, but there are some persistent deeper pockets that have failed to respond to therapy.

- 局部释放系统的种类很多，应根据具体情况，如性价比，医生的操作经验和对各种药物的了解来选择适当的局部释放系统。

- A variety of local delivery products are available, and the decision concerning which one to use will be determined by factors such as cost-effectiveness, and the practitioner's skill and experience with the product.

- 控释装置能长时间维持牙周袋内药物的治疗浓度。一般要求药物在放置时是半固体状，入袋后能固化，并能抵抗龈沟液的冲洗。

- Controlled release devices that maintain therapeutic concentrations in the pocket for extended periods are preferred. These tend to be the products that are semi-solid at time of placement, or solidify in the pocket, to resist being washed out by GCF.

拓展阅读

Further Reading

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第7章 牙周支持治疗

Adjunctive Treatments

目 的

本章全面阐述了在成功的非手术治疗后、对维护牙周组织长期健康稳固有重要作用的牙周支持治疗（supportive periodontal care，SPC）。

Aims

To provide a comprehensive overview of those aspects of supportive periodontal care (SPC) that follow successful non-surgical management and which are essential to long-term periodontal stability and health.

要 点

阅读完本章，读者应当：

- 了解什么是牙周支持治疗（以往称之为牙周"维护"）。
- 理解SPC的目标及如何实现这个目标。
- 理解对患者依从性的要求。
- 理解何为依从性差以及如何改善。

Outcome

After studying this chapter, the reader should:

- understand what is meant by supportive periodontal care (formerly called periodontal "maintenance")
- appreciate the goals of SPC and how they might be achieved
- appreciate the need for patient compliance
- understand how poor compliance is identified and improved.

定 义

SPC 可分为初级和中级。

初级 SPC 重在预防，针对普通人

Definitions

SPC can be categorised as either primary or secondary.

Primary SPC is essentially preventive

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群。其目的是通过专业人员向人们宣传经济有效的口腔健康维护方法，以控制牙龈炎的发展。从长远来看，其目的是防止牙龈炎发展成牙周炎。

and population-based. The aim is to deliver cost-effective dental healthcare measures through community education programmes to limit the development of gingivitis and, in the longer term, to prevent the progression of gingivitis to periodontitis.

中级 SPC 是指通过积极干预的手段缓解症状或巩固疗效。缓解症状的目的是控制或延缓菌斑控制不良患者的疾病。进展主动性和依从性不高、或不能有效刷牙的患者可能导致菌斑控制不良。这些人应定期复查，去除菌斑，以提高功能性牙列的存留时间。

Secondary SPC necessitates intervention and may be palliative or directed at the maintenance of post-treatment stability. The aim of palliative SPC is to limit or slow down the rate of progression of disease in those individuals who are unable to achieve adequate levels of plaque control. This may be because of poor motivation and poor compliance, or because the patient is medically compromised and unable to undertake effective toothbrushing on a regular basis. In such cases, the removal of plaque and calculus at regular recall visits might help to increase the longevity of a functional dentition.

治疗后 SPC 的目的是维持牙周治疗的疗效，并预防或最大限度地减少牙周炎复发。治疗后SPC是牙周治疗后的常规后续疗法，或是对基础治疗反应不佳位点的复治。本章将详细论述与巩固牙周非手术治疗疗效有关的 SPC 的相关内容。

The aim of post-treatment SPC is to maintain the successful outcomes of periodontal treatment and to prevent, or minimise the chance of, disease recurrence. Post-treatment SPC should be the natural extension of periodontal treatment, but may also involve re-treatment of those sites that have failed to respond. This chapter deals with those aspects of SPC that are relevant to maintaining post-treatment stability following non-surgical periodontal management.

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牙周支持治疗的原理

20 世纪 70 年代到 80 年代间进行了一系列经典的纵向研究，其目的是评价 SPC 对曾经接受手术或非手术治疗的晚期牙周炎患者的疗效。结果显示定期复诊达6年以上、并进行专业牙周预防性洁治以去除牙面沉积物、加强刷牙和使用牙间清洁工具的患者能维持：

- 高质量的口腔卫生。
- 健康的牙龈组织。
- 浅牙周袋。
- 附着水平无改变。
- 完整的牙列。

而那些未接受有效 SPC 的患者表现为：

- 牙龈炎症明显。
- 牙周袋加深。
- 进行性附着丧失。
- 牙脱落。

20世纪80年代已发现牙周炎的进展与时间不呈线性相关，而呈一种随机模式，这与牙周炎的活动期和静止期有关。如果基础治疗不彻底或存在不明确的危险因素，牙周炎就难以控制，但若能在SPC期间查出病因，则可

The Rationale for Supportive Periodontal Care

In the 1970s and 1980s a series of classic, longitudinal studies were carried out to assess the efficacy of SPC in patients with advanced periodontitis and who had received surgical or non-surgical therapy. The results of these studies showed that over periods of up to six years, those patients who were recalled on a regular basis for professional prophylaxis, removal of reformed deposits, reinforcement of toothbrushing and the use of interdental cleaning aids were able to maintain:

- excellent standards of oral hygiene
- healthy gingival tissues
- shallow, post-treatment periodontal pockets
- unaltered attachment levels
- an intact dentition.

Those patients who were not enrolled in an effective SPC programme demonstrated:

- frank gingivitis
- deepening of pockets
- continued loss of attachment
- tooth loss.

In the 1980s, it became apparent that the progression of periodontitis on a patient level did not conform to a linear pattern with time but appeared to follow a more random pattern in which periods of active disease were interspersed with periods of

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进行安排复治。

inactivity. If the initial treatment phase is inadequate or if some risk factors are not identified then this pattern of disease progression may persist but it will become evident during SPC and re-treatment can then be arranged.

幸运的是，尽管不能完全保证，但大多数进行SPC的患者均能维持牙周稳定。20世纪90年代的研究证实，尽管医生已经尽力，患者也能定期复诊进行SPC，但仍可发生进行性的附着丧失。受累的位点提示疾病正在进展，但必须指出，SPC能缓解病情。与没有接受SPC的患者相比，SPC可大大延缓疾病的发展。

Fortunately, most patients who comply with a SPC programme will achieve periodontal stability, although this can never be guaranteed. Studies during the 1990s confirmed that a few individuals show continued attachment loss despite the very best efforts of the dental team and regular recall visits for SPC. Affected sites tend to show a more predictable and linear pattern of disease progression and it must also be remembered that, although SPC might be considered palliative for such patients, any disease progression is likely to be much slower with SPC than without.

牙周支持治疗的目标

The Goals of Supportive Periodontal Care

牙周支持治疗的最终目标是消除牙周炎，但这对大多数患者而言是不现实的。1998年美国牙周病学会提出SPC的三个目标是控制炎症、确定进行性破坏的位点和提供辅助治疗。这些目标是：

The ultimate goal of attaining a disease-free mouth is commendable but is neither realistic nor practical for many patients. The three therapeutic goals of SPC that were identified in a position paper of the American Academy of Periodontology in 1998 accept that SPC should be directed towards limiting disease progression, identifying those sites that continue to break down and providing additional treatment when

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- 预防或最大限度减少牙龈炎、牙周炎和种植体周围炎患者的病情复发和病变发展。
- 通过牙列维护和修复体制作以预防和减少牙缺失。
- 及时发现并治疗口腔内新发现的其他疾病。

显然，通过良好的龈上、下菌斑的控制和定期复诊去除新生牙石，可实现第一个目标。但必须根据每位患者的具体情况制定SPC的程序，因此需要对患者的牙科治疗进行更全面的考虑。

indicated. The goals are:

- to prevent or minimise the recurrence and progression of periodontal disease in patients who have been previously treated for gingivitis, periodontitis and peri-implantitis
- to prevent or reduce the incidence of tooth loss by monitoring the dentition and any prosthetic replacements for the natural teeth
- to increase the chance of locating and treating, in a timely manner, other diseases or conditions found within the oral cavity.

Clearly, the first objective is achieved by maintaining optimal supra- and sub-gingival plaque control together with the regular removal of reformed deposits of calculus. However, any programme of SPC must be designed to meet the needs of the individual patient and will, therefore, almost always require a more wide-ranging consideration of the patient's ongoing dental care.

牙周支持治疗的内容

SPC应包括以下部分或全部内容：

- 全身病史、牙科病史和社会史。
- 临床检查和数据记录。
- 放射线检查。

Components of Supportive Periodontal Care

A visit for SPC may include any or all of the following components:

- medical, dental and social histories
- clinical examination and updating records
- radiographic examination

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- 医患沟通。
- 加强菌斑控制。
- 戒烟。
- 预防性龈上洁治。
- 龈下刮治（根面平整）。

- communication
- reinforcement of plaque control
- continued support with smoking cessation
- supragingival prophylaxis
- subgingival instrumentation.

全身病史、牙科病史和社会史

必须记录病史，以确定与牙周炎相关的持续性危险因素，并估计新的危险因素，包括吸烟情况的变化、糖尿病患者的血糖控制情况和精神压力的变化等。

Medical, Dental and Social Histories

Histories should be updated regularly to confirm the presence of persistent risk factors and to identify new risk factors for periodontal disease. This might include recording a change in smoking status, an alteration of glycaemic control in a diabetic patient, or possibly identifying the development of stress.

临床检查和病历记录

必须记录牙周检查的数据，并进行治疗前后的比较：

- 对患者口腔卫生状况的评估。
- 探诊深度。
- 临床附着水平包括牙龈退缩情况。
- 根分叉病变程度。
- 是否有探诊出血。

Clinical Examination and Updating Records

The periodontal examination will provide data that should be compared directly either to the pre-treatment measurements or to clinical measurements made after treatment has been completed:

- a formal assessment of the patient's oral hygiene status
- probing depths
- clinical attachment levels including the extent of gingival recession
- furcation involvement
- presence or absence of bleeding on probing (BoP)

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• 是否有探诊溢脓。

• 牙及种植体的松动度。

每次SPC时都要观察菌斑控制的情况，以判断是否要提高刷牙质量。牙菌斑的量并不能反映该患者牙周炎的发展情况，但复查时有大块龈上牙石的患者则依从性和主动性应值得怀疑。

患者必须按预约的时间复诊（如6个月，12个月，以后每年1次）。对于肉眼观察似乎有少量菌斑沉积，并仅有边缘性龈炎的位点是否要探诊检查，这一点仍存在争议。因为牙周愈合多以长结合上皮为主，而在治疗后的前几个月，长结合上皮的附着尚不十分致密，反复探诊可能对其产生创伤。

探诊深度和附着水平的检查结果与检查者的熟练程度密切相关，即使是同一检查者，用同一牙周探针在不同的时间检查，其结果也可能不同。

• presence or absence of suppuration on probing

• tooth or implant mobility.

The assessment of plaque control should be made at every visit for SPC as this will help to inform the need for reinforcement of toothbrushing measures. The amount of plaque on the teeth tells us very little, if anything, about the disease status of the patient. Nevertheless, the compliance and motivation of those patients who attend for SPC with gross deposits of supragingival plaque might be questioned.

The remaining measurements should be made according to a predetermined time schedule (e.g. at six and 12 months, and then at 12-month intervals thereafter). There is an argument, however, for not probing those sites, which, on usual inspection, appear to have minimal plaque deposits and only superficial gingival inflammation. Sites heal by the formation of a long junctional epithelium and it is important, particularly during the first few months after treatment, that this structure is allowed to adapt tightly to the root surface rather than being persistently traumatised by repeated periodontal probing.

The recording of probing depths and attachment levels are operator sensitive and may show considerable variation, even for the same operator making measurements

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这意味着探诊深度的"增加"和"减少"可能是实际上的改变，也可能是因检查者间的差异引起的。如果探诊深度和附着水平的记录以1mm分级，则可制定2mm的极限阈值，与治疗前相比，2mm或大于2mm的变化显示的是实际改变，而如果变化仅1mm则可能是由于操作过程中的误差所引起的。这些"变化"也应记录在患者的牙周检查图表上（图7-1）。

using the same periodontal probe but on different occasions. This means that a decision has to be made whether a "deterioration" or "improvement" in probing depth is actually a real change or simply a manifestation of intra-operator variability. If a probe with 1 mm gradations is used to record probing depths and attachment levels, it is helpful to set a threshold of 2mm, so that a change of 2mm or more from pre-treatment denotes an actual change, whereas a "change" of only lmm could possibly be due to operator variability. These "changes" can then be highlighted on the patient's periodontal chart (Fig 7-1).

传统的观点认为，牙周袋探诊出血（BOP）意味着此位点正处于病变活动期，可能发生进行性附着丧失（图7-2）。20世纪90年代的研究显示仅有30%的BOP位点发生进行性附着丧失，说明BOP并不是判断牙周炎处于活动期的敏感指标。但是牙周探诊出血消失却是牙周稳定的敏感指标，但应排除吸烟的患者，因为对其而言，这可能是个假象。记录探诊深度的同时应记录BOP。

BoP to the depth of a periodontal pocket has, traditionally, been taken to be an indication of an "active" periodontal site that is undergoing attachment loss (Fig 7-2). Research in the 1990s has determined that only about 30% of those sites that continue to bleed on consecutive visits actually demonstrate additional loss of attachment, thus suggesting that BoP is not a particularly sensitive measure of disease activity. BoP remains a very valuable clinical measurement, however, as an absence of bleeding is a very specific measure of periodontal stability, unless, of course, the patient is a smoker, when such a negative finding may represent a "false negative". Recording BoP can be undertaken at the same time as re-

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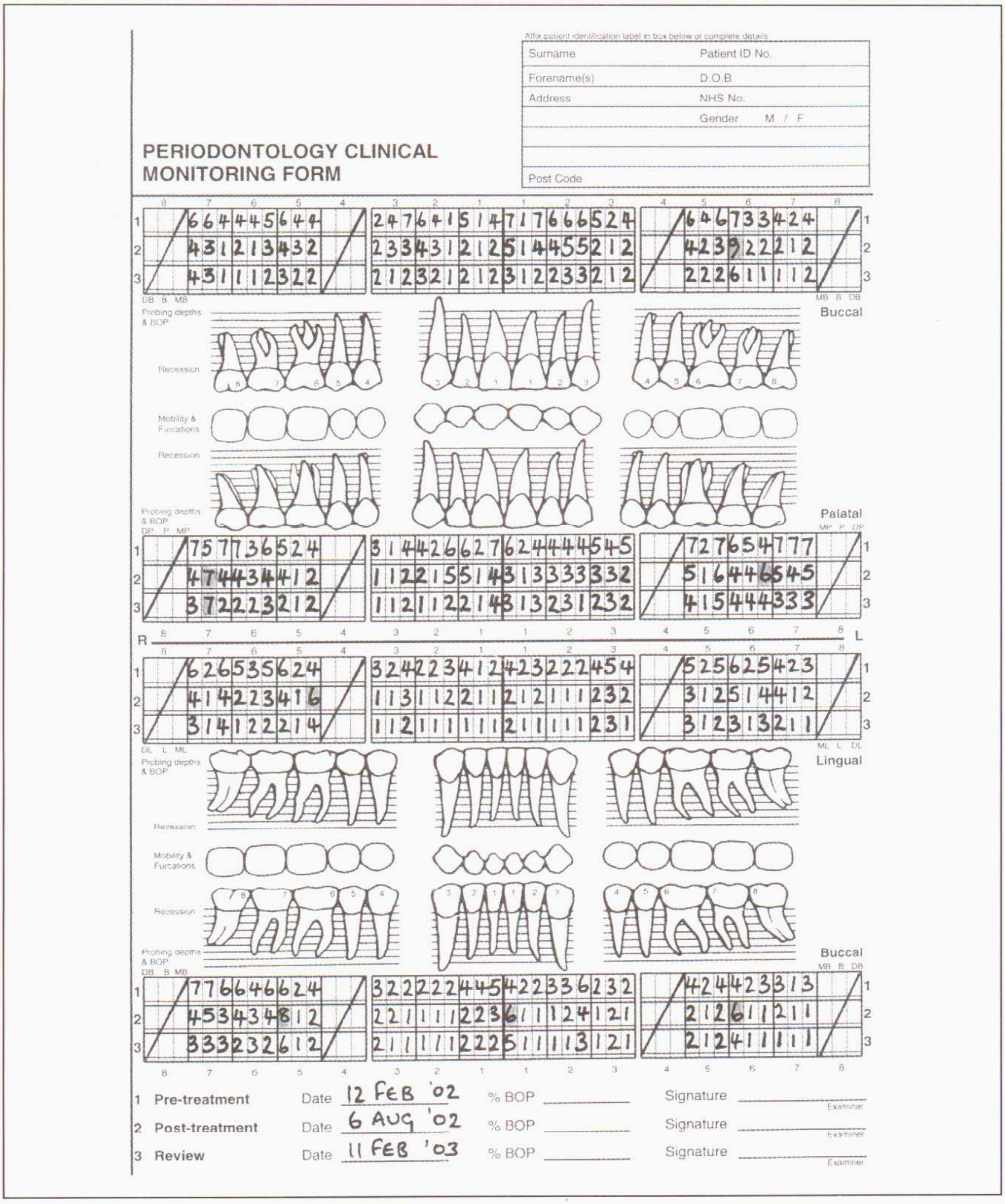


图 7-1　图表显示治疗前、治疗后 6 个月、12 个月的探诊深度检查结果。如果假设 2mm 的域值可反应实际的改变，那么有效的方法是在那些探诊深度加深或减少的位点上色以突出体现。探诊深度加深的位点应重新治疗

Fig 7-1 Chart showing probing depth measurements pre-treatment and six and 12 months following treatment. If a threshold or cut-off of 2mm is assumed to reflect real change then a useful technique is to highlight those sites that are deteriorating and those that are improving. The deteriorating sites are then selected for retreatment.

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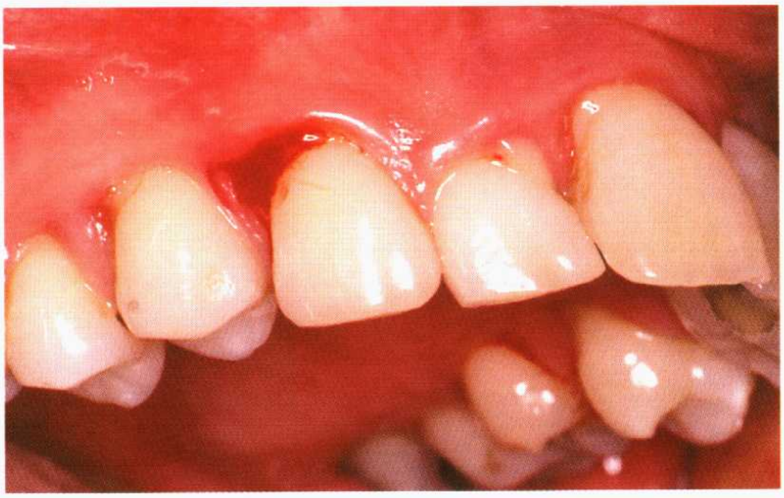


图7-2 以往认为牙周探诊出血意味此位点可能发生进行性附着丧失。但现在认为探诊出血并不是病变处于活动期的敏感指标，但非吸烟患者的探诊出血消失却意味此位点的炎症被控制

Fig 7-2 Bleeding following gentle probing has tradtitionally taken to be a reliable indicator of sites unclergoing continued attachment loss. It has now been accepted that bleeding is not a sensitive indicator of disease activity, although, conversely, the absence of bleeding folloning probing in non-smokers gives a strong indication that the site is periodontally stable

完整的牙科检查还提示其他与后续的SPC相关的信息。牙周治疗后牙龈退缩、牙根暴露，从而可能出现牙本质敏感，乃至根面龋。原先估计预后不良的牙很可能与预计的一样，变成无功能牙或症状加重而致要拔除。缺牙处可行即刻义齿修复，以维持美观和功能，作为对原先治疗方案的补充（图7-3）。

cording the probing depths.

A complete dental examination may also reveal additional information that is relevant to the ongoing SPC. Dentine sensitivity and, in the longer term, root surface caries may be a consequence of gingival recession and exposure of root surfaces following periodontal treatment. Teeth that were originally deemed to have very poor prognoses might, as originally predicted, become non-functional or develop symptoms to the extent that extractions are indicated. Immediate replacement of the teeth for aesthetic or functional reasons may be indicated and, indeed, may have been planned as a contingency option on the original treatment plan (Fig 7-3).

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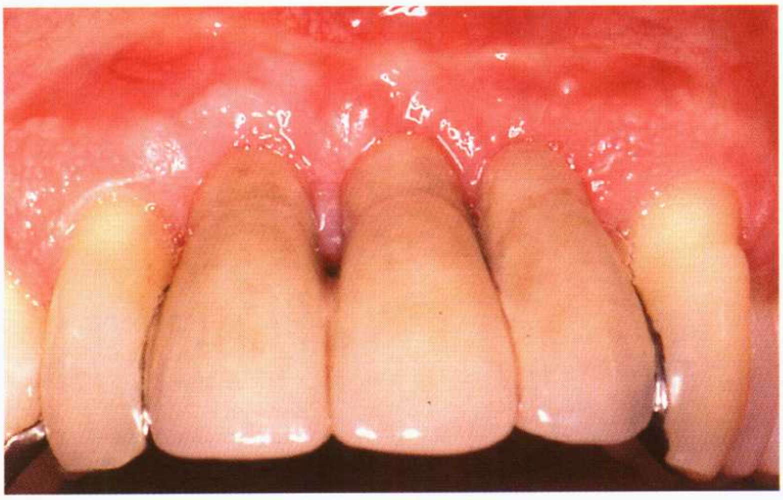


图7-3 所示为一位接受精心非手术治疗后的侵袭性牙周炎患者，但 1|1 2 无法保留，拔除后，进行局部义齿修复。牙周支持治疗期间，患者的龈上菌斑控制良好，义齿基牙预后良好，于是用单基牙树脂粘结桥取代了局部义齿

Fig 7-3 A patient with a history of aggressive periodontitis received an intensive course of non-surgical treatment, although UR1, UL1, UL2 were not saveable. These teeth were extracted and a partial denture provided. During the programme of supportive periodontal care, it was obvious that the patient was able to maintain a high standard of supragingival plaque control, and the prognosis for the abutment teeth to the denture improved significantly. The denture was replaced with a resin-bonded bridge with single abutment teeth

放射线检查

尽管放射线检查是判断骨吸收严重程度和类型的重要依据，因此也是牙周炎早期诊断的重要依据，但在SPC期间多次拍片的意义不大。是否需要重复拍片更多是根据临床医生的经验和判断而定，而不仅仅根据临床表现。但若有常规原则可循，则对临床帮助很大，故制定计划时这种原则适用于所有患者：

Radiographic Examination

While radiographs are essential to determine the severity and pattern of bone loss and, therefore, the initial diagnosis of periodontal disease, there may be very little, if any, additional diagnostic yield achieved through repeating radiographs at frequent intervals during a programme of SPC. The need for repeat radiographs tends to be determined largely by the experience and judgement of the clinician rather than being evidence-based. Nevertheless, it is always useful to have guidelines to follow so that the decision-making process can be applied consistently to all patients:

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• 对临床无明显活动性进展的患者(探诊深度和附着水平稳定或减少，探诊出血消失)，每两年拍一次片。

• 对临床显示处于进展期的患者，每年应根据实际情况决定拍局部的口内片或全景片。

疾病处于进展期表现为：
- 探诊深度增加。
- 进行性附着丧失。
- 牙松动度增加。
- 持续性探诊出血和牙周袋溢脓。
- 牙周脓肿复发。

医患沟通

SPC期间的医患沟通非常重要。告诉患者一些有关他们病情的新进展是很重要的，包括患者的牙周状况，仍有病变的区域，对治疗的反应，预后的变化，SPC的重要性以及是否需要进一步的牙周治疗。所有参与治疗的临床医务人员应定期交流以明确各自的职责，包括牙周的专业治疗、一般牙科治疗以及将来可能需要的治疗。

• In cases where there is little evidence of progressive disease (stable or reducing pocket depths and levels of attachment, and an absence of bleeding on probing), then radiographs might be repeated every two years.

• In cases where the clinical signs suggest disease progression then either intraoral films or a panoramic film might be indicated every 12 months, depending on whether the problem appears to be localised or generalised throughout the mouth. Such signs of disease progression include:
- deepening probing depths
- continued loss of attachment
- increasing tooth mobility
- continued bleeding on probing and suppuration from pockets
- recurrent periodontal abscess formation.

Communication

Communication is an essential part of SPC. It is important for patients to be updated regularly on their periodontal condition, areas of persistent disease, the response to treatment, changes in prognosis, the need for SPC and, where indicated, the need for additional periodontal treatment. There must be regular dialogue between all clinicians who are involved in the patient's care so that the re-

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sponsibilities for different aspects of periodontal and dental treatment, together with future management strategies, can be identified.

加强菌斑控制

龈下刮治后，愈合期内（12个月）龈上菌斑的控制对维持疗效非常重要。研究证实，从长远来看，龈上菌斑的控制对于与阻止或延迟与炎症和疾病进展相关的龈下菌群的再定植密切相关，即若口腔卫生不良，牙周疗效难以维持。

Reinforcement of Plaque Control

Supragingival plaque control is essential for the establishment of the optimal conditions that are required during the healing stage for 12 months following subgingival instrumentation. Studies have also confirmed that, in the longer term, supra-gingival plaque control is crucial in preventing or delaying recolonisation of sites with a subgingival flora that is likely to be pathogenic and associated with persistent inflammation and disease progression. That is to say, without adequate oral hygiene, the benefits of periodontal treatment are not likely to be maintained.

SPC期间复诊时，医生应反复强调每日清除菌斑的重要性（图 7-4）。菌斑控制良好的患者应给予表扬和鼓励。若菌斑控制不良，应向患者展示沉积的龈上菌斑，然后再次评估或根据需要改变或改良刷牙方法和牙间隙清洁工具的使用方法。

The clinician must frequently reinforce the need for effective removal of plaque on a daily basis at SPC visits (Fig 7-4). Those patients who are able to maintain a high standard of plaque removal should be complimented and encouraged. When plaque control appears to be less than adequate, the supragingival deposits should be disclosed, shown to the patient and then the toothbrushing method and the use of interproximal cleaning aids re-evaluated and, if necessary, changed or modified.

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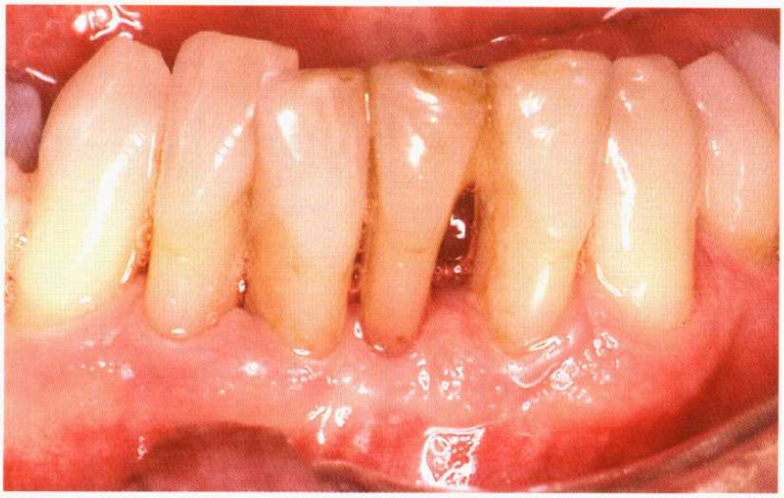


图 7-4 进行牙周支持治疗 5 年的晚期牙周炎患者。龈上菌斑控制良好，下颌切牙 I 度松动但患者咬合功能良好，余留牙的预后良好

Fig 7-4 A patient with advanced periodontitis who has been in aprobramme of supportive periodontal care fot five years. The standard of suprabingival plaque controlis excellent. The mandibular incisors demonstrate grade 1 mobility, although the patient is able to function perfectly well and the probnosis for the remaining dentition is good

龈上预防性洁治和龈下刮治

迄今为止，SPC中最有效的治疗方法是龈上预防性洁治还是龈下刮治，以及哪一种更适用于大部分患者，还不明确。

有综述回顾了1980～2000年间的六项研究，发现在非手术治疗后12个月以上两种方法在探诊深度和附着水平两方面的检查结果无显著性差异。

深入治疗的需要

对于口内有多个位点对非手术治

Supragingival Prophylaxis and Subgingival Instrumentation

As yet, it is unclear whether supragingival polishing or subgingival instrumentation is the most efficacious and therefore appropriate for the majority of patients in SPC.

A systematic review of six studies that were carried out between 1980 and 2000 concluded that the best available evidence indicates that there is no difference between the two regimes with respect to probing depths and attachment levels at 12 months after the completion of non-surgical periodontal treatment.

The Need for Further Treatment

There are instances when patients, or

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疗反应不佳的患者，应考虑是否需要进一步治疗而不是继续进行 SPC。

根面再治疗

反复进行根面平整并无益处，反而可能导致根面的不可逆性破坏或牙本质过敏。但即使是最有经验的医生也难以完全去除龈下菌斑和牙石，尤其是在非手术治疗时。复杂的根面解剖形态增加了治疗的难度。由于炎症持续存在，袋底发生感染，这些位点常常会出血或溢脓。用探针探查可发现这些位点有进行性的附着丧失，并有顽固性的龈下牙石沉积于根面。这些位点需要复治，若器械进入困难，最好选择牙周手术治疗。

对于能高效清除龈下菌斑的患者，并不要求彻底去除龈下牙石。因为牙龈表浅炎症消除后，龈乳头会退缩，牙周袋深度减少及根面暴露，这样能在

more often sites within patients, do not respond to an episode of non-surgical treatment. A decision then has to be made regarding whether to consider further treatment as the alternative to continuing with the SPC.

Re-instrumentation of the Roots

There is no benefit of routinely undertaking repeated instrumentation, as this is likely to cause irreversible damage to the root surface and dentine sensitivity. However, even in the most experienced hands, complete removal of subgingival plaque and calculus is difficult to achieve particularly during non-surgical periodontal treatment. Complex root anatomy will compound the difficulty. These sites usually continue to bleed or suppurate because of the persistent inflammation and infection at the base of the pocket. There is continued loss of attachment and the tenacious subgingival calculus deposits can often be detected on the root surface using an explorer. These sites require retreatment and, if access for instrumentation is restricted, then periodontal surgery might be the best option to eliminate the root surface irritants.

The complete removal of calculus from root surfaces might not be essential in those patients who are able to achieve a very high standard of subgingival plaque removal.

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开放的状态下更有效地去除残余牙石。

The consequent resolution of the more superficial gingival inflammation will lead to a reduction in gingival swelling, reduction in pocket depths and exposure of the roots. This will allow more efficient removal of the remaining calculus as an "open" procedure during retreatment.

抗生素的辅助治疗

上一章已提及局部缓释抗生素的潜在作用，这些药物只能作为口腔卫生控制和根面平整后的辅助治疗。它们不适用于菌斑未彻底去除的患者，而适用于菌斑彻底去除，但对非手术治疗反应不佳的少量位点。持续释放的药物能有效抑制袋底或牙周结缔组织内的牙周致病菌，使伤口进入愈合阶段。

Adjunctive Antimicrobials

The potential role of locally delivered, slow-release antimicrobials has been discussed in the previous chapter. These agents should only be used adjunctively and following the phases of hygiene therapy and root surface instrumentation. They are not a substitute for inadequate plaque removal, but may be indicated when there remain a small number of sites that appear to be resistant to non-surgical treatment despite adequate plaque control. The sustained levels of antimicrobial drug may be sufficient to eliminate persistent periodontal pathogens at the base of the pocket or situated within the adjacent periodontal connective tissues so that the healing process can begin.

牙周支持治疗的开始

临床观点认为，SPC应开始于非手术治疗结束后。牙周组织的愈合发生于治疗后的前两个月内。在此期间，患者的自我菌斑控制对长结合上皮愈合

Commencement of the Supportive Periodontal Care Phase

From the practical viewpoint, SPC starts when the instrumentation phase of non-surgical management has been completed. The healing phase occurs within the first two

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的成功很关键。非手术治疗后6～8周不能进行牙周探诊，否则会破坏长结合上皮的愈合而不能体现牙周治疗的疗效。

months after treatment. It is during this period that the patient's own plaque control is critical for the successful maturation of the long junctional epithelium. It is important that the post-treatment periodontal probing is not performed within six to eight weeks following the completion of instrumentation because this would disrupt the healing process and would not reveal the full extent of periodontal healing if performed too early.

牙龈形态的适应性改变和结缔组织的稳定可能发生在非手术治疗后的6个月内，9个月后边缘龈的位置才比较稳定。因此SPC阶段不仅是牙周治疗后牙周组织的愈合和稳定阶段，也是牙周治疗疗效长期维持的关键阶段。

Further adaptive changes to gingival morphology and consolidation of the connective tissues may occur during the six and nine months following treatment when the position of the gingival margin is likely to stabilise. The SPC should, therefore, be considered crucial to both the healing and stabilisation phases as well as to the long-term maintenance of periodontal health.

牙周支持治疗阶段的复诊次数

最佳的复诊次数现在尚未明确，但有研究建议在治疗后的前6个月内每两周1次，以后每三个月1次进行定期洁治。选择三个月的间隔是因为牙周致病菌会在没有进行SPC的三个月后再定植于牙周袋。但三个月的复诊间隔时间并不适用于每位患者；对于高危患者，复诊次数应增加，而危险性不高、对治疗反应良好的患者可6个月后复诊，或间隔时间更长。

Frequency of Visits for Supportive Periodontal Care

The optimal frequency for SPC visits has not been clearly established although there is evidence to suggest that visits for professional tooth cleaning during the initial six-month healing phase should be every two weeks and then on a three-monthly basis thereafter. This three-month interval is based on the approximate time it takes for periodontal pathogens to recolonise pockets following treatment in the absence

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of SPC. Nevertheless, a three-month recall frequency may be inadequate for all patients; those at greater risk from progressive disease may require a greater frequency of recall whereas those at lower risk and who respond more favourably to treatment may be recalled every six months, or perhaps less frequently.

治疗后某些情况下需要更多次复诊，但必须合理安排且具循证性，根据每位患者的具体情况决定长期的复诊次数。表7-1列举了对复诊次数有直接影响的因素。表7-2举例示范对两位假想的患者制定的牙周支持治疗计划。

A schedule that involves more frequent visits in the immediate post-treatment period is logical and evidence-based, but should be integrated with the practical approach of letting the individual needs of each patient determine the frequency of recall for SPC in the longer term. Factors that may directly influence the recall period are given in Table 7-1. Examples of supportive periodontal care programmes for two hypothetical patients are given in Table 7-2.

表 7-1 可能影响SPC期间复诊次数的因素

Table 7-1 Factors that should be taken into consideration wen evaluating the frequency of recall visits for SPC

复诊次数宜少	复诊次数宜多
无危险因素	吸烟、精神压力、控制不良的糖尿病
依从性好的患者	依从性不确定的患者
菌斑控制良好	菌斑控制不良
无出血／溢脓	普遍出血和溢脓
浅牙周袋	深牙周袋
慢性牙周炎	侵袭性牙周炎
对治疗反应好	对治疗反应不佳

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表 7-2　非手术治疗后两位患者的牙周支持治疗计划

Table 7-2　Case scenarios of two patients who require supportive periodontal care programmes following non-surgical periodontal treatment

病 例 1	治 疗 计 划
男性，42 岁，无吸烟，中重度慢性牙周炎患者，对牙周治疗的积极性高，菌斑控制良好，每区段有一个 5mm（无出血）深的牙周袋。	• 基础治疗后每三个月复诊，加强清洁牙间隙，并强调对 5mm 牙周袋的龈下清洁。 • 进行龈上洁治，预防性去除牙石和菌斑。若袋深不变、患者依从性良好，复诊间隔可延长至六个月。 • 每年记录一次探诊深度。
病 例 2	**治 疗 计 划**
女性，50 岁，晚期牙周炎患者。日吸烟 25 支，烟龄 30 年。基础治疗疗效不佳。努力进行菌斑控制，但不会使用牙间清洁工具。双侧上颌第二磨牙松动，有多个探诊出血的深袋（>8mm）。	• 开始每月复诊一次，加强口腔卫生宣教，进行龈上预防性洁治。 • 三个月后，再次评价仍会出血的深袋是否因基础治疗不彻底所致及是否需要进一步治疗。 • 告知患者如果准备戒烟，则可提供更好的建议和支持。 • 以后每三个月复诊一次。若口腔卫生始终控制不良，为缓解病情，必须定期刮治和抛光。

牙周支持治疗期间危险因素的控制

吸烟是牙周病的高危因素，必须告知患者两者间的关系。吸烟者了解后，多数会试图戒烟，而且许多患者会进一步努力戒烟。吸烟的患者在牙周治疗期间配合戒烟，是牙科医师和临床技师制定最佳 SPC 计划的绝佳机会（图 7-5）。

Managing Risk Factors During Supportive Periodontal Care

Smoking is one of the most significant and prevalent risk factors for periodontal disease and smokers must be made aware of this association. Most smokers have, at some time, made an attempt to quit the habit and many are willing to make further attempts when they learn of the link between smoking and periodontal disease. If a

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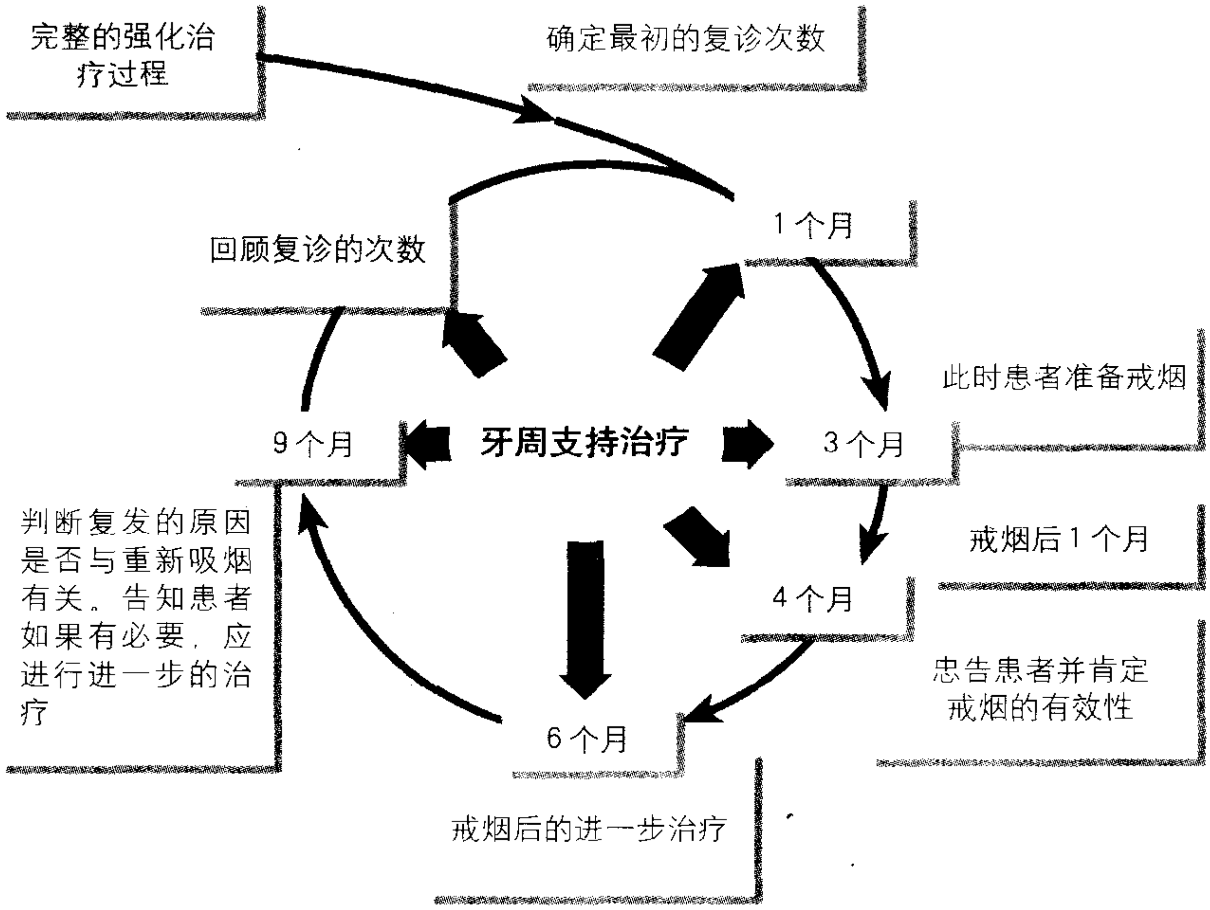


图7-5 图示为一假想的伴吸烟这一危险因素的慢性牙周炎患者提供牙周支持治疗、戒烟支持和建议的可能的治疗时机

Fig 7-5 Diagram showibg the potential opportunity to provide supportive periodontal care and smoking cessationsupport and advice for a hypothetical patient who suffers from dhronic periodontitis that ws associated with smoking as risk factor

但必须告知患者，因戒烟后，去除了尼古丁对牙龈微血管的收缩作用可能导致牙炎症的反弹，并保证经过彻底的牙周治疗，此症状会消失。

smoker is able to set a quit date that coincides with their periodontal treatment then the programme of SPC provides the ideal opportunity for the dentist or hygienist to provide additional support and encouragement (Fig 7-5).

Unfortunately, when smokers with periodontal disease are successful in quitting the habit they often notice a "rebound gingivitis" and an increase in gingival bleed-

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ing as the vasoconstrictive effect of nicotine on the gingival microvasculature is no longer present. Patients should be warned about this possibility and reassured that the bleeding will resolve again once the periodontal treatment has been successfully completed.

牙周支持治疗期间患者的依从性

患者的依从性是影响牙周治疗远期疗效的重要因素之一，特别在 SPC 期。研究显示，牙周治疗后30天，仅有50%的患者会持续进行口腔卫生维护，约10%的患者可能丧失依从性。甚至约 33% 的患者基础治疗后从不复诊，只有 15% 的患者会进行长期的 SPC。

患者缺乏依从性的多种原因：

- 效果不如意。
- 受时间限制。
- 治疗的复杂性。
- 治疗的费用。
- 精神压力。
- 医患关系不佳。

Compliance with Supportive Periodontal Care

One of the most significant factors that affect the long-term success of periodontal treatment is patient compliance, particularly with SPC. Studies have shown that, even after 30 days, only 50% of subjects are likely to remain compliant with oral hygiene instructions and around 10% will be non-compliant. Furthermore, there are data to suggest that approximately 33% of periodontal patients who have treatment never return for the SPC phase of management and only 15% of patients comply with SPC in the long-term.

There are many reasons for non-compliance with periodontal care:

- a perceived unfavourable treatment benefit
- the time involved
- complexity of the treatment
- cost of the treatment
- stress
- poor relationship with the professionals providing the care

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- 对所提供的治疗不满意。
- 受朋友和家人的影响。

患者缺乏依从性的最主要原因可能是他们对牙周病缺乏了解，不认真对待。牙周病是慢性进展性疾病，偶会发生疼痛，也不危及生命。也有人认为牙周病的治疗仅仅是医生的责任。许多患者忽略了自身因素在牙周病治疗中的重要作用。

- dissatisfaction with the treatment provided
- the influence of friends and family.

With periodontal disease, perhaps the principal reason that contributes towards non-compliance is the patient's unwillingness to acknowledge that there is a real problem. The disease is chronic and slowly progressing, only occasionally accompanied by painful symptoms, and is certainly not a life-threatening illness. There is also the belief that it is the responsibility of the dentist, therapist or hygienist to manage the problem. Many patients fail ever to grasp the importance of their own role in the successful outcome of treatment.

提高患者依从性的方法

提高患者依从性的方法有：

- 用通俗易懂的语言与患者沟通。
- 提醒患者复诊，并确保患者和整个牙科治疗团队在治疗期间的良好交流。
- 保留无依从性患者的记录，在患者失约的第一时间内通知患者。
- 告知患者牙周病的病因。了解患者对治疗的期望，并与患者一起

Ways to improve patient compliance

Possible methods of improving compliance include:

- Simplify instructions given to patients.
- Remind patients about appointments and ensure that there is excellent communication between the patient and all members of the dental team involved in their care.
- Maintain records of any non-compliance and try to contact the patient at the earliest opportunity when they fail to attend an appointment.
- Inform the patient about the precise cause of periodontal disease. Find out

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讨论其自身在目标实现中所能做的努力。

what the patient's expectations are and then discuss the means by which the patient can contribute to achieving these expectations.

- 尽量给予患者积极的肯定或建设性的批评。
- 尽早发现无依从性的患者。若在牙周治疗的洁治期间就发现患者的依从性不佳，应及时向患者说明若不改变这种行为可能出现的结果和不良预后。

- Give positive feedback and constructive criticism whenever possible.
- Try to identify non-compliance as early as possible. Failure to comply with instructions given during the hygiene phase of periodontal treatment will allow the dentist to explain to the patient the likely outcome and reduced prognosis should behavioural change not be forthcoming.

临床要点

Conclusions of Clinical Importance

- 牙周支持治疗是牙周病治疗的极重要的组成部分，治疗计划应因人而异。
- SPC 期间的复诊时间应因人而异。
- 作为 SPC 的一部分，病史和临床检查记录应及时更新。
- 对大多数患者，SPC 期间的预防性龈上洁治是有效的，但也必须对牙周基础治疗反应不佳的牙周袋进行复治。
- SPC 期，患者的依从性是取得牙

- Supportive periodontal care is a crucial component of periodontal management and programmes should be tailored to the needs of individual patients.
- The optimal frequency of visits for SPC should also be tailored to individual patient needs.
- Historics and clinical rccords must bc updated as part of the SPC programme.
- Supragingival prophylaxis is an effective strategy for most patients in SPC but retreatment of pockets that fail to respond may also be necessary.
- Compliance of the patient with SPC

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周治疗远期疗效的最重要保障。

is the most significant barrier to the long-term success of periodontal management.

拓展阅读
Further Reading

1 Heasman PA, McCracken GI, Steen N, Sanz M. A systematic review of periodic subgingival debridement compared with supragingival prophylaxis in supportive periodontal care. J Clin Periodontol 2003;30: In Press

2 Jenkins WMM, Said SH, Radvar M, Kinane DF. Effect of subgingival scaling during supportive therapy. J Clin Periodontol 2000;27:590-596.

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